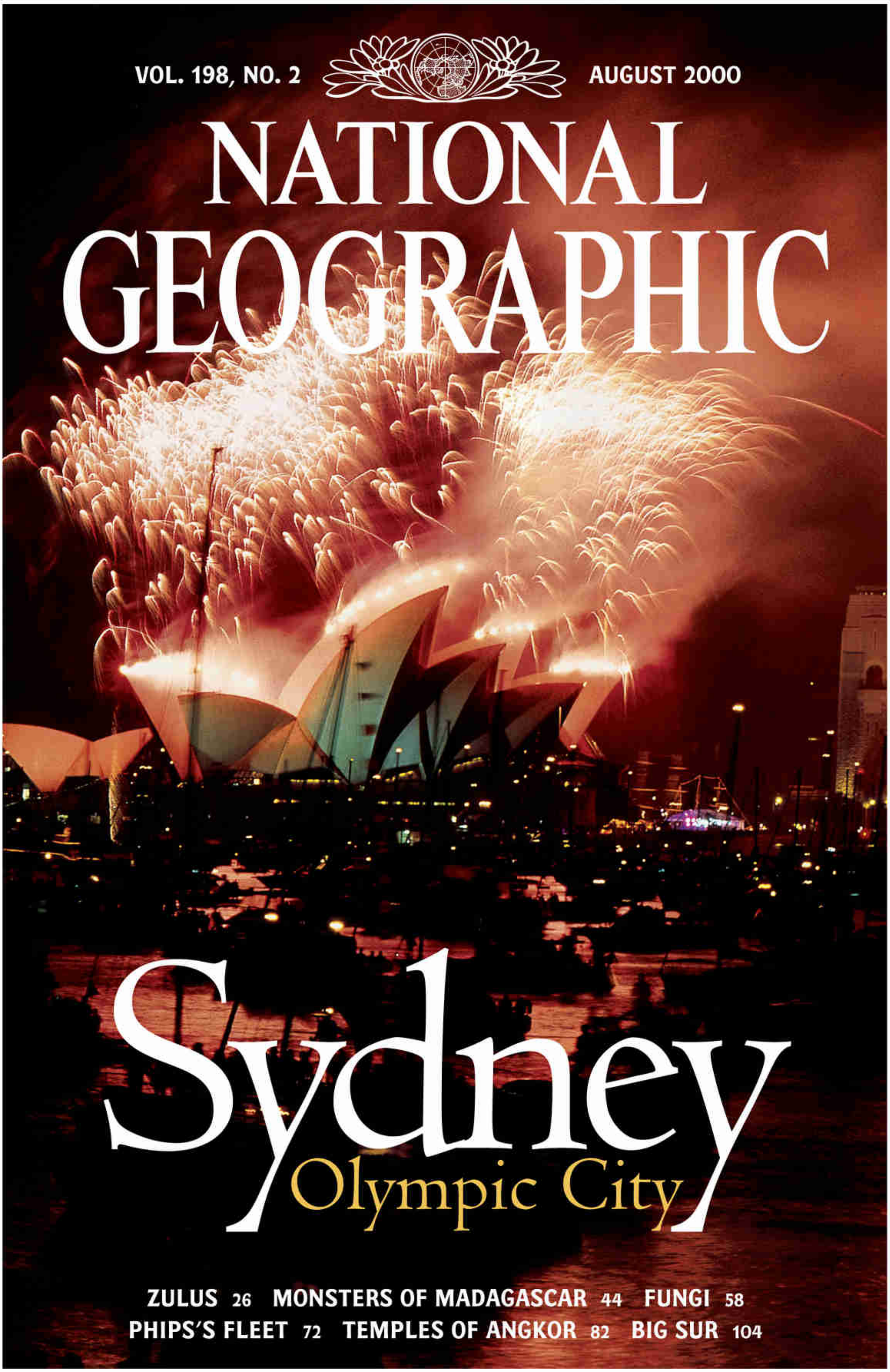
VOL. 198, NO. 2 AUGUST 2000

NATIONAL GEOGRAPHIC



Sydney
Olympic City

ZULUS 26 MONSTERS OF MADAGASCAR 44 FUNGI 58
PHIPS'S FLEET 72 TEMPLES OF ANGKOR 82 BIG SUR 104

SYDNEY Olympic Park
THE GREEN GAMES

NATIONAL GEOGRAPHIC SOCIETY

DOWNTOWN SYDNEY

HOMEBUSH BAY

The tidal bay next to Olympic Park is nobody's idea of pristine, thanks to by-products of old manufacturing, including Agent Orange. Dioxin levels in the bay's sediments remain among the highest in the world.

TEAR OUT MAP

THE BRICK PIT

When the endangered green-and-golden bell frog was found living in this deserted quarry earmarked for Olympic tennis, plans were revised and the habitat protected. Though concentrated here, the species lives throughout Olympic Park.

BASEBALL STADIUM

The stadium's grandstand roof required 22 percent less steel than conventional designs and channels rainwater into underground tanks for irrigation.

BASEBALL
MODERN PENTATHLON

OLYMPIC PARK STATION

Mass transit is a key innovation at the Sydney Games. Only official cars are permitted on site; all spectators must use public transportation. Part of a 54-million-dollar (U.S.) rail upgrade, this new, state-of-the-art train station will be tested by millions of game-watchers.

DOME AND PAVILIONS

BADMINTON
BASKETBALL
GYMNASTICS
HANDBALL
MODERN PENTATHLON
VOLLEYBALL

OLYMPIC BOULEVARD

Lighting this boulevard are 19 powerful solar towers. All sidewalks and plazas are covered with "eco-paving"—perforated tiles through which storm-water runoff is collected. Treated, the runoff will irrigate new surrounding parklands.

SYDNEY INTERNATIONAL AQUATIC CENTRE

Opened in 1994, this facility was designed to be green, with a groundbreaking ozone filtration system that cuts the use of toxic chlorine in pools 60 percent.

DIVING
MODERN PENTATHLON
SWIMMING
SYNCHRONIZED SWIMMING
WATER POLO

SYDNEY INTL. TENNIS CENTRE

TENNIS

NEW SOUTH WALES STATE SPORTS CENTRE

TABLE TENNIS
TAE KWON DO

SYDNEY INTL. HOCKEY CENTRE

HOCKEY

OLYMPIC STADIUM

Site of opening and closing ceremonies, this facility uses no PVC plastics in its 110,000 seats, minimal air-conditioning, and only rainwater collected on the roof to water the playing field. Like other venues its construction was an exercise in sustainable environmental practices.

SOCCER
TRACK AND FIELD

SYDNEY SUPERDOME

All the Superdome's energy comes from renewable sources, including solar panels on the roof. It was built with recycled materials—steel, timber, and concrete. Even the dome itself is recycled—insulated with enough recycled paper to fill 65,000 Sydney phone books.

BASKETBALL
GYMNASTICS

MAIN PRESS CENTRE

SYDNEY INTL. ARCHERY PARK

ARCHERY

WATER WORKS

All the nonpotable water used during the games—for irrigation and flushing toilets, for example—will come from rainwater or recycled sewage. The sewage is double treated by biological processes and pumped (via non-PVC pipe) to every facility in Olympic Park.

KRONOS HILL

One of the big problems facing organizers was disposal of a century's worth of rubbish and industrial waste. One solution: landfills such as Kronos Hill, an 82-foot landscaped mound where low-level toxic waste is stored under three feet of earth. Runoff is collected and treated.

ANNIE GRIFFITHS BELT (SYDNEY OLYMPIC PARK); BOB PETERS, OLYMPIC CO-ORDINATION AUTHORITY (FROG)

SOURCES: GREENPEACE AUSTRALIA, OLYMPIC CO-ORDINATION AUTHORITY, SYDNEY ORGANISING COMMITTEE FOR THE OLYMPIC GAMES

As recently as the 1970s Homebush Bay, site of the Olympic Games in Sydney, was the kind of industrial no-man's-land that most people went out of their way to avoid. For more than a century these tidal wetlands had served the city as a combination rubbish dump and factory zone, used by tenants ranging from the state slaughterhouse and brickworks to the naval arms depot. "When I was growing up here, you thought twice about taking a deep breath outdoors," recalls Judy Harrington, a 53-year-old naturalist. "These days I look around and I can't believe my eyes."

In its bid to host the Olympic Games, Sydney committed itself to producing a "green" Olympics at a reclaimed Homebush Bay, designed by the state government in partnership with the environmental organization Greenpeace. Working together, these groups laid out strict guidelines related to global warming, ozone layer and biodiversity protection, the avoidance of toxic materials, and the management of waste, water, and energy—and lived up to them more fully than many thought possible.

OLYMPIC VILLAGE

Largest solar-powered suburb on Earth, the athletes' housing was built with environmentally sound materials such as plantation timber and nontoxic paint. Most pipes are free of PVCs. The solar-heated units feature a model waste-and-water recycling system and run on energy generated by some 6,000 solar panels.

WASTE MANAGEMENT CENTRE

An emphasis on recycling will be a hallmark of these games, with virtually no nonrecyclable materials used on site. Collected trash will be sorted and taken to a recycling plant or a composting plant.

MAP PRINTED ON RECYCLED PAPER

Sydney

HOST OF THE 2000 SUMMER OLYMPIC GAMES

NATIONAL GEOGRAPHIC SOCIETY

Home today to four million people, Sydney was founded as a far-flung penal colony for the British Empire in 1788, when the first fleet of convict ships landed at what is now Circular Quay. A rough-and-tumble port for much of its history, Sydney has been transformed in the past few decades into one of the world's most alluring cities, where a multitude of nationalities have made a home for themselves and become, in the process, Australian.

PARALYMPIC GAMES

The flame of the Paralympics ignites in Olympic Park in October for 4,000 world athletes with disabilities. Among the 18 events are four sports, such as wheelchair rugby, unique to these "parallel Olympics," first held in Rome in 1960.

THE ROCKS

Sandstone crags where the first convicts built their huts anchored a ramshackle port that mellowed in the 1930s into a working-class neighborhood with a pub on every corner. The Rocks is a slice of Sydney's checkered past, served up daily to tourists.

SYDNEY HARBOUR BRIDGE

Called the Coat Hanger for its slope-shouldered design, the Sydney Harbour Bridge opened in 1932. Climbing tours offer views from its arch, which peaks 442 feet above the water.

SYDNEY OPERA HOUSE

"Clearly a controversial design," wrote the judges who in 1957 chose the sketches submitted by Danish architect Jørn Utzon in a competition for Sydney's new opera house. Opened in 1973, it endures as Sydney's waterfront trademark.

SYDNEY HARBOUR

Sydney's harbor is renowned for natural deepwater channels. Yet its greatest value may be intangible: "The harbor," writes author Jan Morris, "seems to me less a spectacle than an event . . . a perpetual pageant, punctuated by astonishments."

TARONGA ZOO

A spectacular collection of native and exotic animals looks out over Sydney Harbour. Conservation and research are emphasized, along with displays of animals from wombats to Sumatran tigers.

SYDNEY HARBOUR NATIONAL PARK

This 972-acre reserve is composed of scattered parcels encompassing islands, headlands, and beaches—"all the things about Sydney that make you want to get up early," says one resident.

SYDNEY OLYMPIC PARK
ARCHERY
BADMINTON
BASEBALL
BASKETBALL
DIVING
GYMNASTICS
HANDBALL
HOCKEY
MODERN PENTATHLON
SOCCER
SWIMMING
SYNCHRONIZED SWIMMING
TABLE TENNIS
TAE KWON DO
TENNIS
TRACK AND FIELD
VOLLEYBALL
WATER POLO

RYDE WATER POLO

SYDNEY OLYMPIC PARK

OLYMPIC PARK STATION

Sydney International Archery Park

Bicentennial Park

Olympic Village

LIDCOMBE

RYDE

MEADOWBANK

GLADESVILLE

HUNTERS HILL

LONGUEVILLE

LANE COVE

CHATSWOOD

WILLOUGHBY

CASTLECRAG

NORTHBRIDGE

CAMMERAY

CROWS NEST

NORTH SYDNEY

CREMORNE

MOSMAN

SEAFORTH

MANLY

QUEENSCLIFF

CLIFTON GARDENS

WATSONS BAY

VAUCLUSE

DOVER HEIGHTS

ROSE BAY

NORTH BONDI

BONDI BEACH

BONDI

WAVERLEY

WOOLLAHRA

PADDINGTON

KINGS CROSS

SURRY HILLS

DARLING HARBOUR

CENTRAL STATION

CIRCULAR QUAY

THE ROCKS

BALMAIN

DRUMMOYNE

CONCORD

MORTLAKE

HOMEBUSH

BURWOOD

FIVE DOCK

HABERFIELD

LEICHHARDT

GLEBE

STANMORE

Parramatta River

Lane Cove River

Middle Harbour

North Harbour

Port Jackson (Sydney Harbour)

Sydney Harbour

Tasman Sea

PACIFIC OCEAN

Sydney Harbour National Park
Other open space
Olympic venue
Railway with station

0 mi 1
0 km 1

SOURCES: LAND INFORMATION CENTRE, NEW SOUTH WALES (BASE MAP); OLYMPIC CO-ORDINATION AUTHORITY; SYDNEY ORGANISING COMMITTEE FOR THE OLYMPIC GAMES
NATIONAL GEOGRAPHIC MAPS

OLYMPIC PARK

This reclaimed industrial wasteland is a study in green environmental design, put to the test for the Sydney Olympic Games. The park's innovations create an Olympics far greener than any in modern history.

DARLING HARBOUR

Sydney's busiest port in the 19th century was once all wharves and cargo. Today it's connected by footbridge to the rest of downtown and features wall-to-wall attractions, from the city's toniest shopping to theaters, museums, and the Sydney Aquarium.

CIRCULAR QUAY

Site of the first British anchorage in 1788, this historic landing is today Sydney Harbour's transportation hub, a combination street theater, railway terminal, and jumping-off place for the thousands of suburbanites who commute via ferry to their jobs downtown.

ROYAL BOTANIC GARDENS

Gardens covering 74 acres were set aside in 1816 by Governor Lachlan Macquarie and thrive as Australia's oldest scientific institution. Besides 7,000 species of plants, the grounds contain a prime vantage point for harbor events: Mrs. Macquarie's Chair, a natural stone bench favored by the governor's wife.

CHINATOWN

Though an 1850s gold rush brought many Chinese to Sydney, the shops and restaurants of today's Chinatown reflect the impact of a wave of emigrants from China and other Asian countries since the 1970s.

FOX STUDIOS

"Australia 2000," an exhibit featuring the work of NATIONAL GEOGRAPHIC photographers as well as historical prints from the GEOGRAPHIC archives, will be displayed at Byron Kennedy Hall, Fox Studios, September 1 through 21.

BONDI BEACH

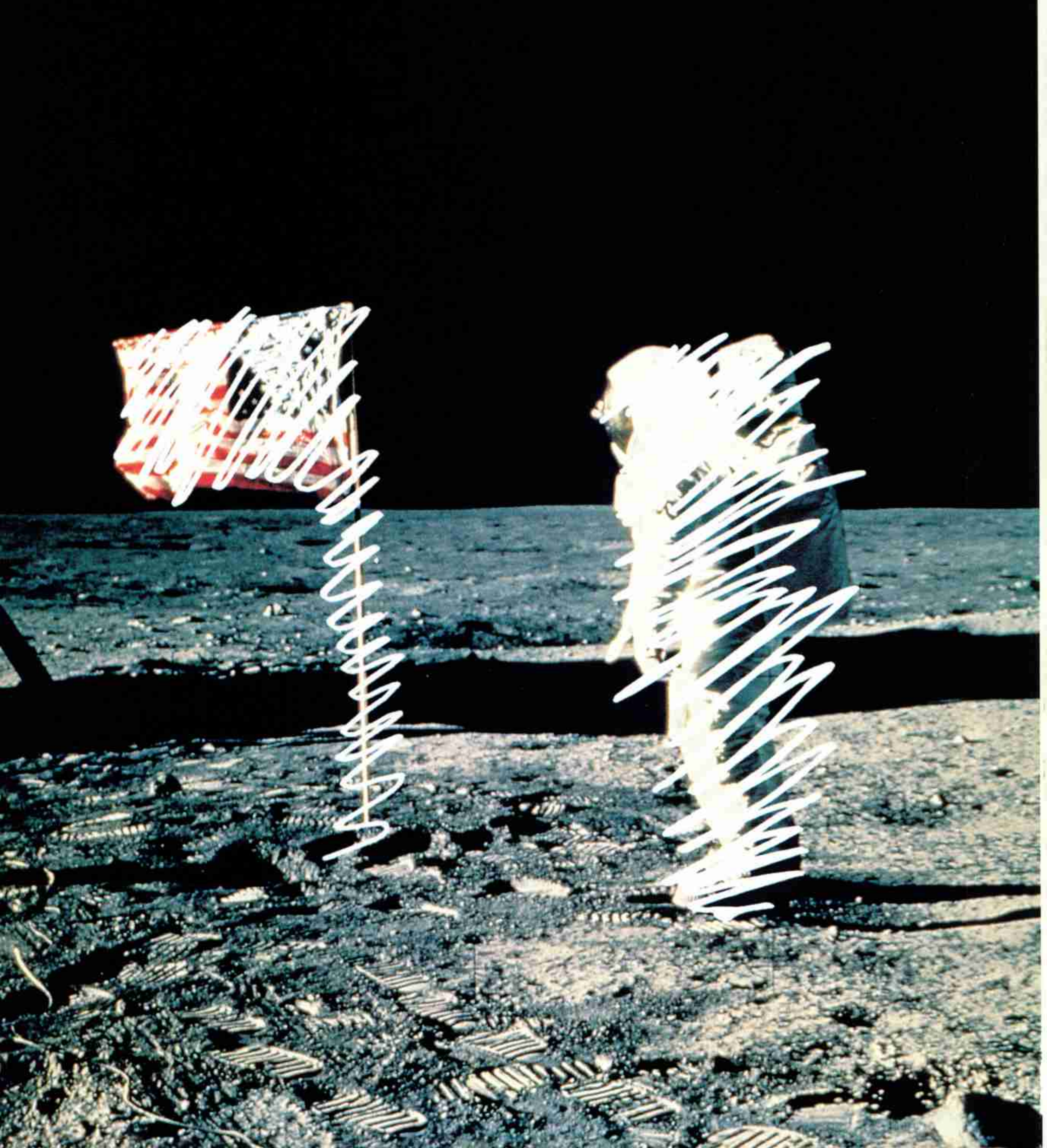
Symbol of Sydney's laid-back lifestyle, Bondi is a mile-long stretch of sand within cycling distance of downtown. Site of the Olympic beach volleyball competition, Bondi is accustomed to crowds: A good day in summer will draw tens of thousands of people.

METROPOLITAN SYDNEY





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THE GREATEST RISK IS NOT TAKING ONE.

They do not write the stories of those who played it safe. Yet that is what most of us do. It is inherent in our nature to avoid risk. From the earliest age there is something that tells us to sidestep danger. Perhaps because of that, there is also something in us that admires the risk taker, the adventurer, the person with the courage to step up to the edge of the precipice and believe that he can make it to the other side.

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EXPLOIT

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OR EXPLORE?



Time and again at Shell we're discovering the rewards of respecting the environment when doing business. If we're exploring for oil and gas reserves in sensitive areas of the world, we consult widely with the different local and global interest groups. Working together, our aim is to ensure that bio-diversity in each location is preserved. We also try to encourage these groups to monitor our progress so that we can review and improve the ways in which we work. We see this process as an important investment in our goal of sustainable development, balancing economic progress with environmental care and social responsibility. It won't happen overnight. But lessons like these are helping us move forward – with careful steps.

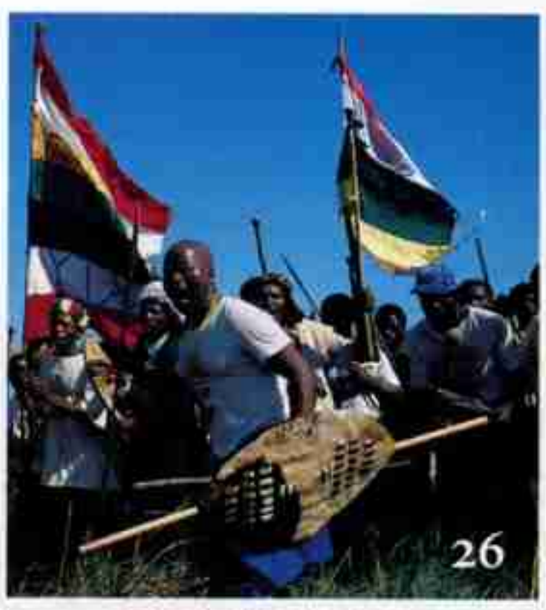
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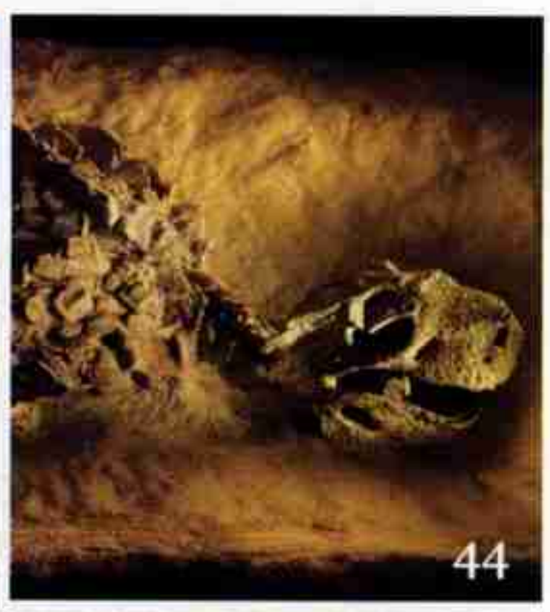

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NATIONAL GEOGRAPHIC

AUGUST 2000

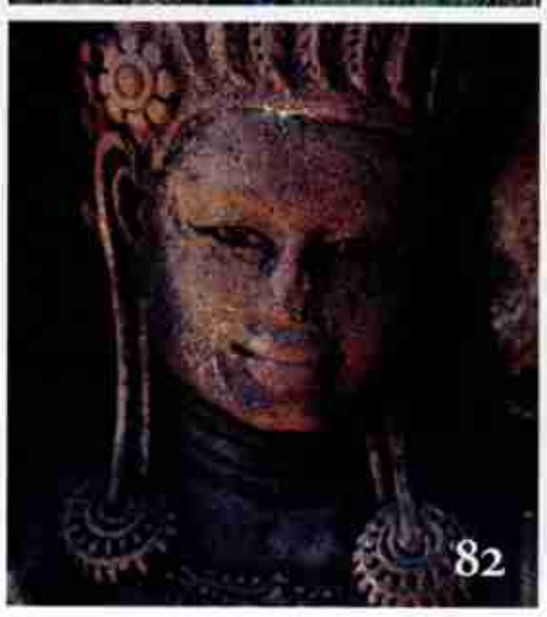


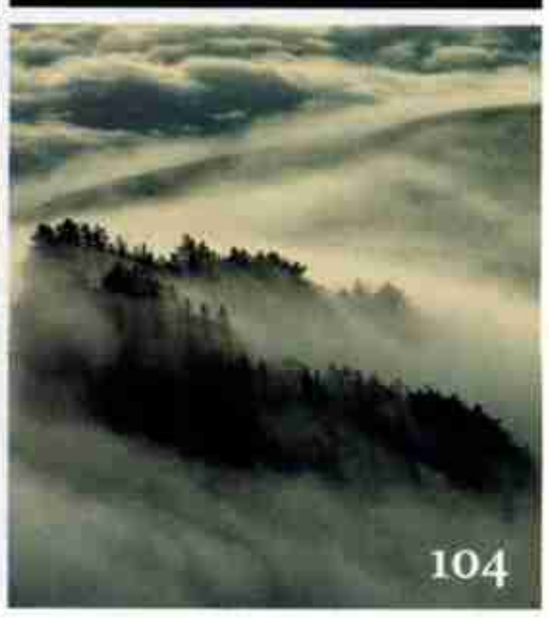












2 **Sydney** *When the Summer Olympics turn the spotlight on Sydney, Australia's host city will reach for the gold in presentation, originality, and unpretentious gusto for life.*
BY BILL BRYSON PHOTOGRAPHS BY ANNIE GRIFFITHS BELT

■ *Special Supplement: Sydney Olympics tear-out map*

26 **People of Heaven** *Scarred by apartheid and ensnared in bloody conflict, the Zulus, South Africa's most populous ethnic group, seek hope for the future by taking pride in tradition.*
BY PETER GODWIN PHOTOGRAPHS BY ED KASHI

44 **Monsters of Madagascar** *Pug-nosed herbivorous crocodiles, flesh-eating birds, and what may be the oldest dinosaurs ever found enrich the fossil record of Mesozoic creatures.*
BY JOHN FLYNN AND DAVID KRAUSE PHOTOGRAPHS BY MARIA STENZEL AND MARK THIESSEN ART BY MARK HALLETT

58 **Fungi** *Nature's recyclers, these ubiquitous organisms both nourish and destroy life by living on plants, animals, and even us.*
ARTICLE AND PHOTOGRAPHS BY DARLYNE A. MURAWSKI

72 **Phips's Fleet** *Retreating from a failed attack on Quebec in 1690, Sir William Phips lost at least one of his ships in the St. Lawrence River. Its discovery sheds new light on everyday life in the American Colonies.*
BY R. JAMES RINGER PHOTOGRAPHS BY BILL CURTSINGER

82 **The Temples of Angkor** *Preservationists in Cambodia struggle to keep Angkor's sacred temples intact while looters threaten to erase the few remaining traces of the ancient Khmer Empire.*
BY DOUGLAS PRESTON PHOTOGRAPHS BY STEVE McCURRY

104 **Big Sur** *Along 90 miles of California coastline, Big Sur rises in a spectacular meeting of pounding sea and stark wilderness. In this rugged sanctuary nature is as unforgiving as it is beautiful.*
BY PICO IYER PHOTOGRAPHS BY FRANS LANTING

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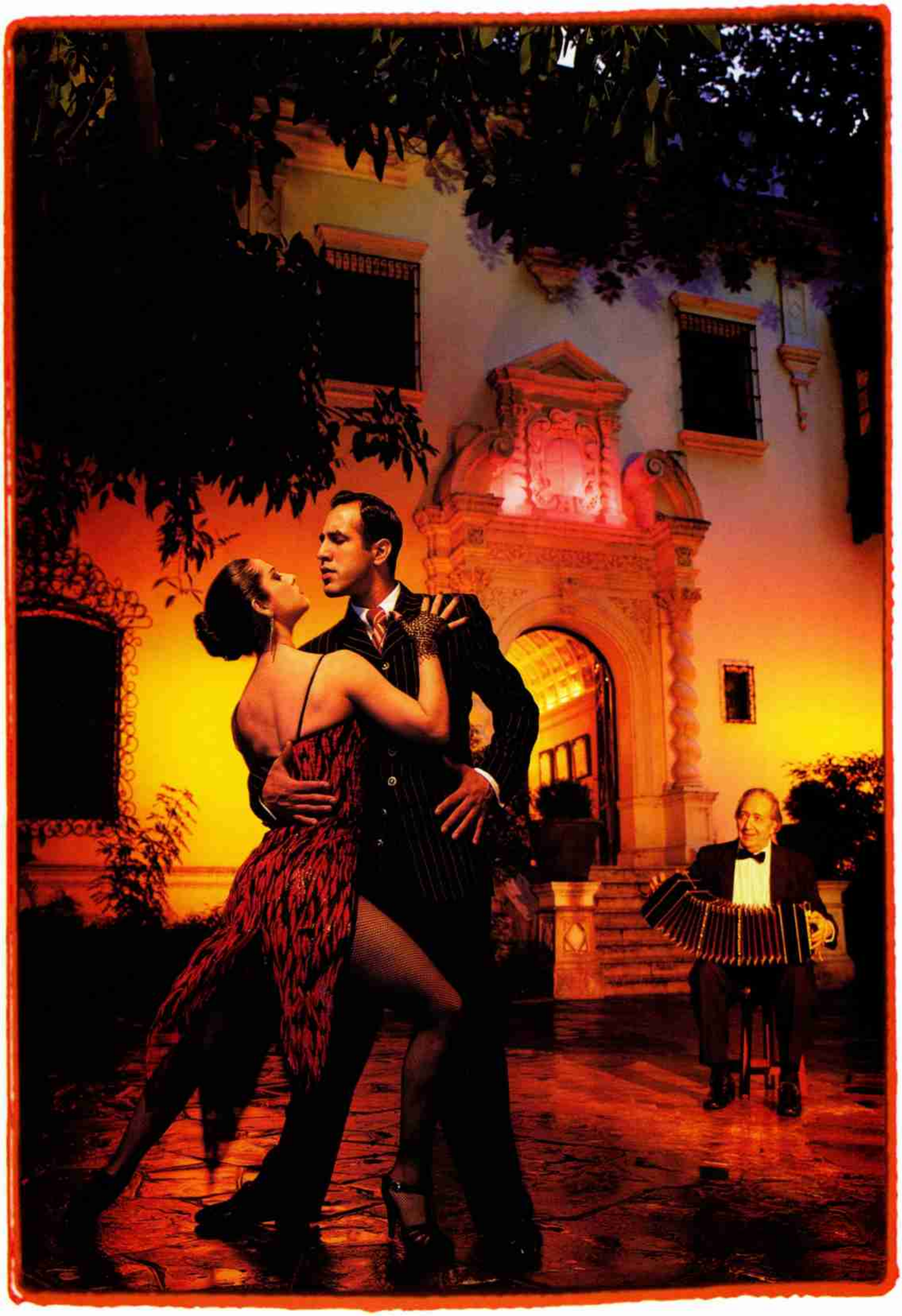
The Cover

At midnight last New Year's Eve, Sydney Harbour exploded with the light and sound of more than 20 tons of fireworks, illuminating the celebrated Opera House. Photograph by Annie Griffiths Belt

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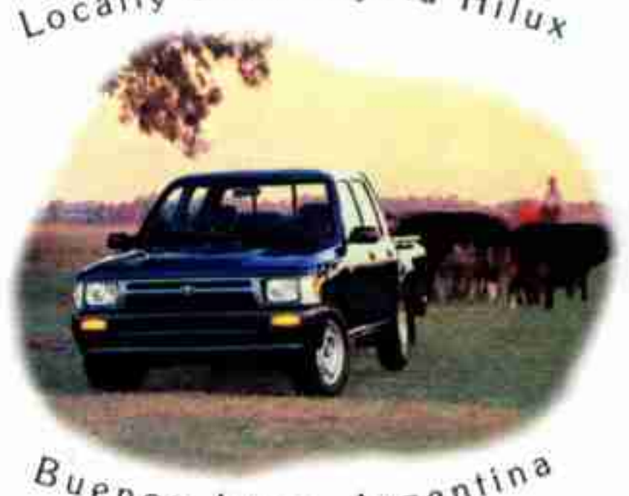
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The tango of Argentina is more than just a dance, it's a language unto itself. With the stomp of a heel, or the raise of an eyebrow, accomplished 'tangueros' weave complex tales of love, honor and intrigue. When two perfectly matched partners dance the tango,



they are celebrated as living archives of Argentina's culture and history. But when discussion turns to Argentina's future, the locals may mention a different partnership.

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Today, Toyota vehicles are manufactured locally in 26 countries around the world, including here in the U.S. In fact, more than half the Toyota vehicles sold in America are built by Americans, using many local parts as well.

In today's growing global marketplace, Toyota remains committed to investing in the communities where we do business. Because, as any Argentinean will tell you, amazing things can happen when great partners get together.

TOYOTA People Drive Us

NATIONAL GEOGRAPHIC

On Assignment



■ BIG SUR

Warming to His Work

Flameproof coveralls protected Frans Lanting as he shot the raging fires in Big Sur last fall (left). But the place first sparked his interest long ago. "In 1972 I came to the United States from Holland as a student and hitchhiked all over the country. I had read Jack Kerouac's *On the Road,* so I wanted to see this Big Sur he wrote about." Today Frans can glimpse the region's coastline from his bedroom window in Santa Cruz. Though he's famous for photographing nature from Africa to Antarctica, Frans welcomed this assignment as "a chance to really explore this place I always see."

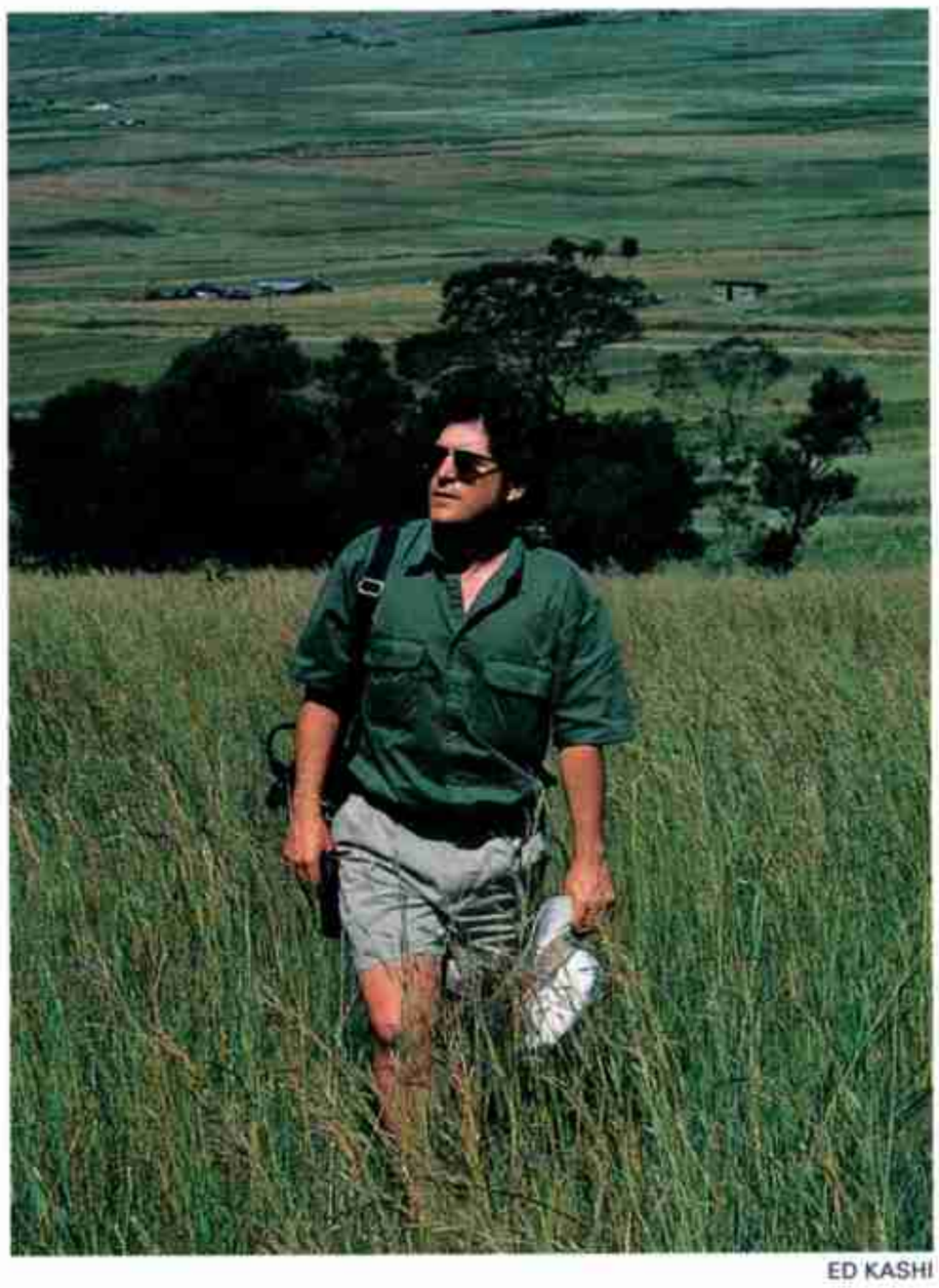
MARK OATNEY

■ THE ZULUS

Into Africa

"We kept getting shot at by mistake," says writer Peter Godwin (right) of reporting on Zulus in South Africa. "I thought I'd gotten out of the war-correspondent business." Peter, in fact, was once wounded while traveling with rebels in Uganda.

Africa is close to his heart. Born and raised in Zimbabwe, Peter later moved to England—earning a law degree from Cambridge and doing postgraduate work at Oxford. He then returned to Zimbabwe. After a year of practicing human rights law there, "a place where human rights were not a priority," he began writing full-time. Soon he branched out into broadcast journalism, traveling the world to make documentaries for the BBC. Peter's award-winning memoir, *Mukiwa: A White Boy in Africa,* was published in 1996. He is now at work on a novel exploring man's relationship with nature.



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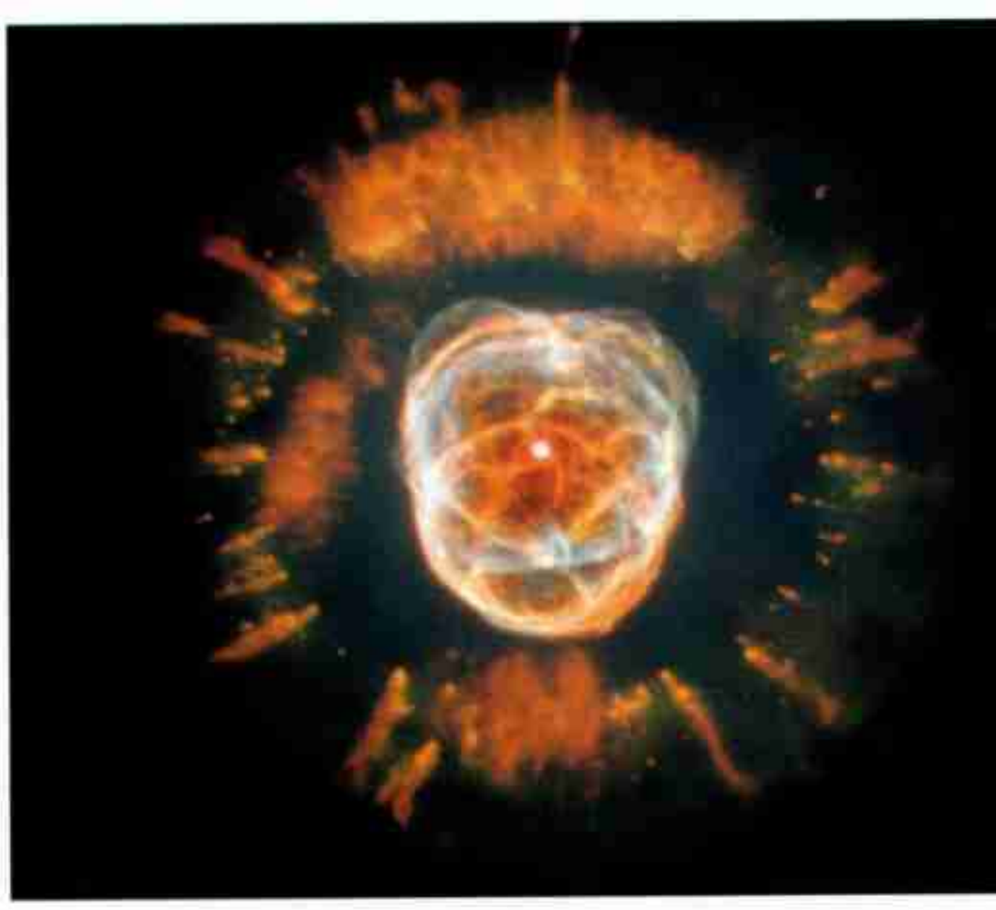
Geographica



YIVO INSTITUTE FOR JEWISH RESEARCH (ABOVE); MIRIAM WEINER (TOP INSET); MIRIAM WEINER COLLECTION

Tracking the History of Eastern Europe's Jews

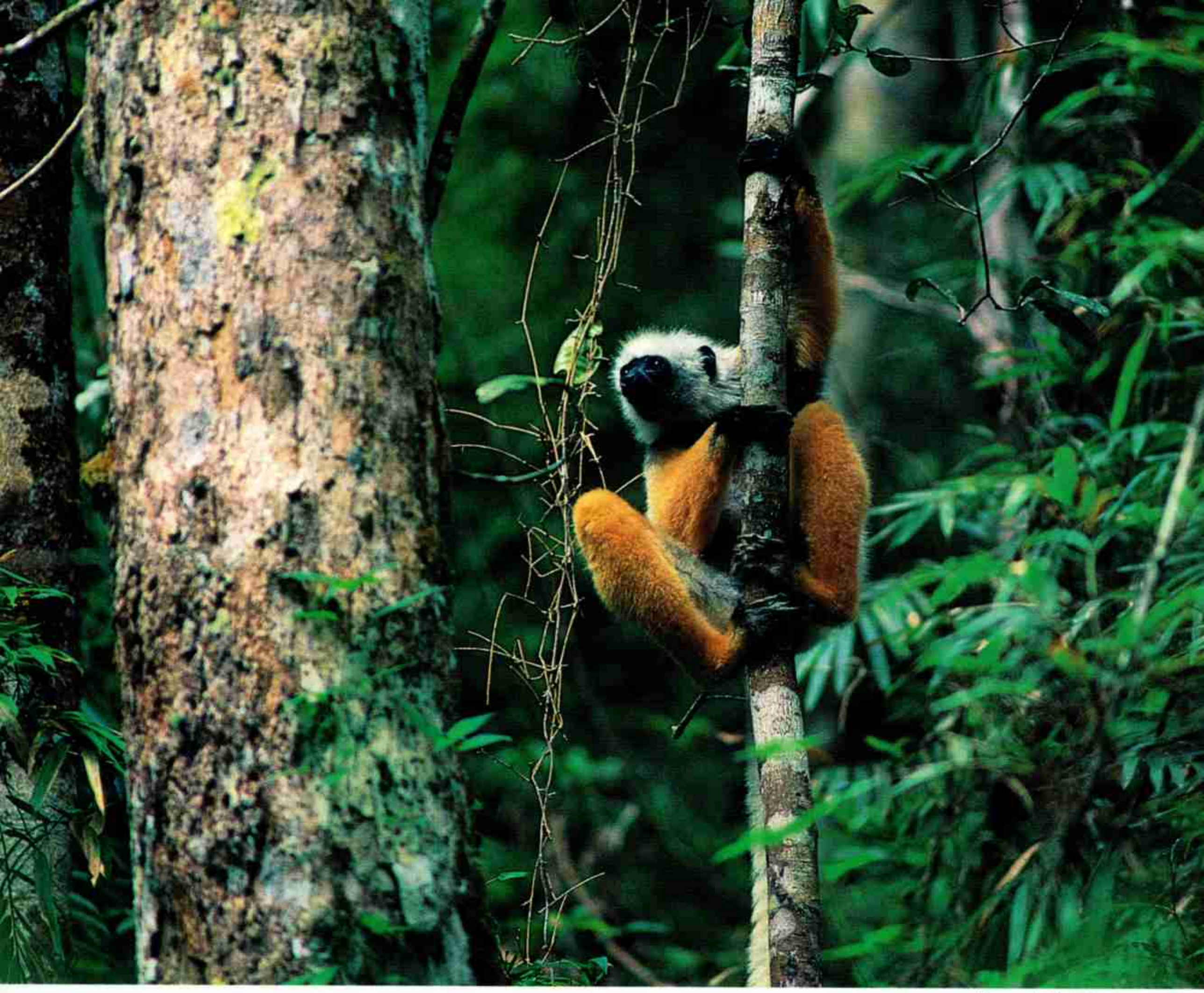
Since the Iron Curtain's fall a decade ago, American author-genealogist Miriam Weiner has dug up the roots of Jewish life in Poland, Ukraine, and Moldova. Her books display town-by-town guides to birth records, census data, and voter lists. They also hold moving photographs, like this 1920 scene (above) of Jewish men in Shepetivka, Ukraine—birthplace of Weiner's grandmother—at the cemetery, its new gate paid for by immigrants in the U.S., or the 1915 postcard of a Kiev synagogue, again a place of worship after years of use as a puppet theater (above right). "This is not about inanimate objects in the archives; it's about discovering a family," Weiner says.



Hubble Illuminates Star Death

Named for its likeness to a face in a fur-lined parka, the Eskimo nebula offers a glimpse of the eventual demise of our solar system. Last January NASA scientists pointed a reserviced Hubble Space Telescope toward the Eskimo, 5,000 light-years away, capturing with unprecedented clarity this image of a dying star. It sits in a cloud of gas shed during the star's red giant phase and emblazoned with cometlike condensation. Stellar wind expands from its center at 900,000 miles an hour. In five or six billion years our sun will burn out in a similar but perhaps less spectacular fashion.

SOHO-STSCI, ESA/NASA



Photographed by Nick Garbutt

WILDLIFE AS CANON SEES IT

Traveling in groups of two to eight, diademed sifakas spend the day foraging in the forest canopy for flowers, fruits and leaves. They sometimes descend to the ground for fallen fruit or for bouts of play-wrestling. Within their home range of about 40 hectares, the sifakas maintain contact through vocalizations. At the sight of a predator, they alert one another with alarm calls that signify either a ground or an aerial intrusion. The diademed sifaka is one of Madagascar's largest lemurs, and probably the most striking due to its golden limbs and long, silky pelage. It is threatened by habitat loss and, in some areas, by hunting.

As a global corporation committed to social and environmental concerns, we join in worldwide efforts to promote greater awareness of endangered species for the benefit of future generations.



Diademed Sifaka *(Propithecus diadema diadema)*
Size: Head and body length, 50-55 cm; tail, 44-50 cm
Weight: 6-7.25 kg
Habitat: Rain forests of central and northeastern Madagascar
Surviving number: Unknown; populations are fragmented and exist only at low densities

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NATURE
Watch "NATURE" on PBS. This program is funded, in part, by Canon.

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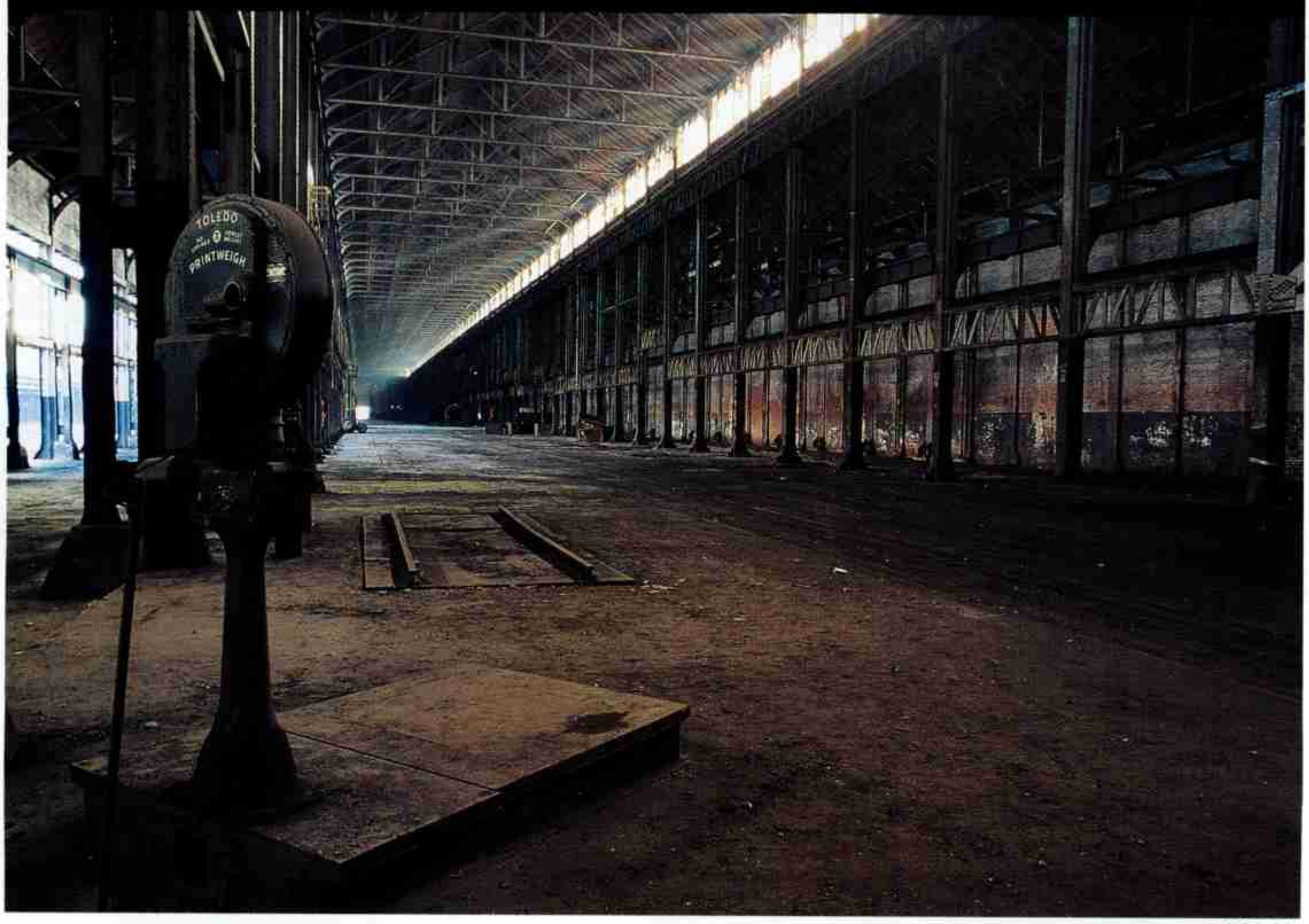
Exploring the Origins of Angkor

Long before the temples of Angkor (page 82) in Cambodia began to rise in the ninth century, a rich culture flourished to the north, across the present-day border with Thailand. Since 1993 Charles Higham (left), a New Zealand archaeologist, has been excavating settlements 150 miles from Angkor. At one site, Noen U-Loke, he found this metal-bedecked skeleton of a male who died in his 20s about A.D. 300. The man wore four bronze belts, 20 wrist bangles, more than 120 finger rings, and over 30 toe rings. Most notable: huge bronze disks in his earlobes, like those seen in Angkor's bas-reliefs. "These people spawned the Angkor state," says Higham.

New Future for an Old Steel Mill

Stripped of its equipment, a former machine shop (below) sits silent, and wind whistles through the broken windows of empty buildings at the Bethlehem Steel Corporation's idle 1,800-acre plant. Iron production first began at the Bethlehem, Pennsylvania, mill in the 1860s; at its peak, 30,000 workers produced the steel that framed American skyscrapers. In 1998 the firm shut down the plant, a victim of competition and a changing market. But new uses—from offices and retail shops to ice hockey rinks and swimming pools—are in store for many of its buildings. This machine shop, a third of a mile long, by 2005 will house the National Museum of Industrial History, affiliated with the Smithsonian Institution. Another refurbished building will display original equipment to trace the history of steelmaking. A museum preview center is scheduled to open next year.

TEXT BY BORIS WEINTRAUB



IRA BLOCK

IMAGINE IF YOU COULD PLAN YOUR DAY AROUND YOUR LIFE INSTEAD OF YOUR ARTHRITIS PAIN.

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IMPORTANT INFORMATION ABOUT VIOXX.

In rare cases, serious stomach problems, such as bleeding, can occur without warning. People with allergic reactions, such as asthma, to aspirin or other arthritis medicines should not take VIOXX.

Tell your doctor if you have liver or kidney problems, or are pregnant. Also, VIOXX should not be used by women in late pregnancy.

VIOXX has been extensively studied in large clinical trials. Commonly reported side effects included upper respiratory infection, diarrhea, nausea and high blood pressure. Report any unusual symptoms to your doctor.

ASK YOUR DOCTOR OR HEALTHCARE PROFESSIONAL ABOUT VIOXX.

Call 1-800-853-1516 for more information, or visit www.vioxx.com. Please see important additional information on the next page.

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Patient Information about
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VIOXX® (pronounced "VI-ox")
for Osteoarthritis and Pain
Generic name: rofecoxib ("ro-fa-COX-ib")

You should read this information before you start taking VIOXX*. Also, read the leaflet each time you refill your prescription, in case any information has changed. This leaflet provides only a summary of certain information about VIOXX. Your doctor or pharmacist can give you an additional leaflet that is written for health professionals that contains more complete information. This leaflet does not take the place of careful discussions with your doctor. You and your doctor should discuss VIOXX when you start taking your medicine and at regular checkups.

What is VIOXX?

VIOXX is a nonsteroidal anti-inflammatory drug (NSAID) that is used to reduce pain and inflammation (swelling and soreness). VIOXX is available as a tablet or a liquid that you take by mouth.

VIOXX is a medicine for:
- relief of osteoarthritis (the arthritis caused by age-related "wear and tear" on bones and joints)
- management of acute pain in adults (like the short-term pain you can get after a dental or surgical operation)
- treatment of menstrual pain (pain during women's monthly periods).

Who should not take VIOXX?

Do not take VIOXX if you:
- have had an allergic reaction such as asthma attacks, hives, or swelling of the throat and face to aspirin or other NSAIDs (for example, ibuprofen and naproxen).
- have had an allergic reaction to rofecoxib, which is the active ingredient of VIOXX, or to any of its inactive ingredients. (See Inactive Ingredients at the end of this leaflet.)

What should I tell my doctor before and during treatment with VIOXX?

Tell your doctor if you are:
- pregnant or plan to become pregnant. VIOXX should not be used in late pregnancy because it may harm the fetus.
- breast-feeding or plan to breast-feed. It is not known whether VIOXX is passed through to human breast milk and what its effects could be on a nursing child.

Tell your doctor if you have:
- kidney disease
- liver disease
- heart failure
- high blood pressure
- had an allergic reaction to aspirin or other NSAIDs
- had a serious stomach problem in the past.

Tell your doctor about:
- any other medical problems or allergies you have now or have had.
- all medicines that you are taking or plan to take, even those you can get without a prescription.

Tell your doctor if you develop:
- ulcer or bleeding symptoms (for instance, stomach burning or black stools, which are signs of possible stomach bleeding).
- unexplained weight gain or swelling of the feet and/or legs.
- skin rash or allergic reactions. If you have a severe allergic reaction, get medical help right away.

How should I take VIOXX?

VIOXX should be taken once a day. Your doctor will decide what dose of VIOXX you should take and how long you should take it. You may take VIOXX with or without food.

Can I take VIOXX with other medicines?

Tell your doctor about all of the other medicines you are taking or plan to take while you are on VIOXX, even other medicines that you can get without a prescription. Your doctor may want to check that your medicines are working properly together if you are taking other medicines such as:
- methotrexate (a medicine used to suppress the immune system)
- warfarin (a blood thinner)
- rifampin (an antibiotic)
- ACE inhibitors (medicines used for high blood pressure and heart failure).

What are the possible side effects of VIOXX?

Serious but rare side effects that have been reported in patients taking VIOXX and/or related medicines have included:

- Serious stomach problems, such as stomach and intestinal bleeding, can occur with or without warning symptoms. These problems, if severe, could lead to hospitalization or death. Although this happens rarely, you should watch for signs that you may have this serious side effect and tell your doctor right away.
- Serious allergic reactions including swelling of the face, lips, tongue, and/or throat which may cause difficulty breathing or swallowing occur rarely but may require treatment right away.
- Serious kidney problems occur rarely, including acute kidney failure and worsening of chronic kidney failure.
- Severe liver problems occur rarely in patients taking NSAIDs. Tell your doctor if you develop symptoms of liver problems. These include nausea, tiredness, itching, tenderness in the right upper abdomen, and flu-like symptoms.

In addition, the following side effects have been reported: hallucinations, unusual headache with stiff neck (aseptic meningitis).

More common, but less serious side effects reported with VIOXX have included the following:

Upper and/or lower respiratory infection and/or inflammation
Headache
Dizziness
Diarrhea
Nausea and/or vomiting
Heartburn, stomach pain and upset
Swelling of the legs and/or feet
High blood pressure
Back pain
Tiredness
Urinary tract infection.

These side effects were reported in at least 2% of osteoarthritis patients receiving daily doses of VIOXX 12.5 mg to 25 mg in clinical studies.

The side effects described above do not include all of the side effects reported with VIOXX. Do not rely on this leaflet alone for information about side effects. Your doctor or pharmacist can discuss with you a more complete list of side effects. Any time you have a medical problem you think may be related to VIOXX, talk to your doctor.

What else can I do to help manage my osteoarthritis pain?

Talk to your doctor about:
- Exercise
- Controlling your weight
- Hot and cold treatments
- Using support devices.

What else should I know about VIOXX?

This leaflet provides a summary of certain information about VIOXX. If you have any questions or concerns about VIOXX, osteoarthritis or pain, talk to your health professional. Your pharmacist can give you an additional leaflet that is written for health professionals.

Do not share VIOXX with anyone else; it was prescribed only for you. It should be taken only for the condition for which it was prescribed.

Keep VIOXX and all medicines out of the reach of children.

Inactive Ingredients:

Oral suspension: citric acid (monohydrate), sodium citrate (dihydrate), sorbitol solution, strawberry flavor, xanthan gum, sodium methylparaben, sodium propylparaben.

Tablets: croscarmellose sodium, hydroxypropyl cellulose, lactose, magnesium stearate, microcrystalline cellulose, and yellow ferric oxide.

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Forum

The April cover story on great white sharks caught the attention of people fishing for a good shark tale. A reader from Australia remarked: "When we first started receiving National Geographic *more than a decade ago, my first priority was to get my hands on it before my sister did. My second priority was to check for any articles on great white sharks. Thirteen years later the article I'd always dreamed of is reality, and written by Peter Benchley too! My sister will have to buy her own copy."*

Great White Sharks

You wanted to de-demonize great white sharks and show that they are not the ruthless hunters of humans they are usually thought to be. Yet you chose the ferocious and all too common toothy photo of the great white on your cover when inside you had some beautiful and mesmerizing photos of the sharks. The cover photo and many of the larger photos inside do nothing but remind us of their toothier bits.

TIFFANY DAVENPORT
Amsterdam, Netherlands

If I had received only this one issue for the price of membership, it would be worth every penny. I have been fascinated with sharks for many years and thought that I wouldn't be surprised by the information presented in this article. I was wrong. Peter Benchley brought the great white shark to the world through your magazine, not as the monster of his famous novel but as an integral part of the environment that needs to be protected and studied.

MAC McGEHEE
Newport News, Virginia

I took my Geographic to my appointment at the Philadelphia Hand Center, where I have been receiving therapy for my right hand after a snowblower accident. After seeing the picture of Andre Hartman putting his hand onto the nose of a great white shark (pages 21-2), it struck me that here was definitely a potential candidate for hand therapy.

ROYAL McGEORGE, JR.
King of Prussia, Pennsylvania

As an abalone diver on Australia's south coast, I have more than a passing interest in the great white shark. I thoroughly enjoyed the article but must challenge the claim regarding shark repellents that "there has been relatively little progress over the past 50 years." The use of electricity in repelling sharks has been a major breakthrough and is now accepted for a range of applications. Just as a vehicle seat belt does not guarantee survival in a car accident, the electric shark repellent does not guarantee survival in a shark encounter. I will continue to use both, however, in the knowledge that each is effective in reducing the chance of injury or death.

PETER RONALD
Warrnambool, Australia

Many articles have convinced me that great whites are not interested in our comparatively low percentages of body fat, but even I have eaten brussels sprouts when I was hungry enough.

ROBERT GRAY
Amelia Island, Florida

Yemen

Only an extraordinary non-Arab person, perhaps a jinni, could capture and reflect so nicely on the realities of this country and its people.

AHMEN K. HELMY
Bahía Blanca, Argentina

Andrew Cockburn quotes a U.S. National Institute of Drug Abuse study as showing that qat produces few signs of serious physical or psychological side effects. The U.K.'s Institute for the Study of Drug Dependency lists the following problems resulting from excessive use of qat: heart disease, loss of sex drive, oral cancer, and psychological problems such as depression, anxiety, and irritation.

STAN BATES
Pogmoor, England

Chiquibul Cave

The bat skeleton included in calcite in the Chiquibul cave (page 63) belongs to an individual of the genus *Artibeus,* recognizable by the proportions and the skull shape. These bats are largely responsible for the dispersal of seeds of pioneer plant species and, therefore, for tropical forest recovery.

RODRIGO A. MEDELLÍN
Instituto de Ecología, UNAM
Mexico City, Mexico

San Pedro River

Barbara Kingsolver's simply told yet mesmerizing elegy to Arizona's San Pedro River stands out as one of the most beautiful pieces of writing ever to grace your pages. Eschewing the shrill rhetoric one often hears in connection with environmental issues, her eloquent description of how this special place is gradually being erased would bring a tear to the eye of even the most hardened desert rat. It did to mine.

EDWARD G. KORAN
Phoenix, Arizona

Kingsolver hardly mentions the fervent efforts by several groups to save the river. Fort Huachuca is doing a number of things to conserve water and is using less each month. At the facility where I work, lawn grass is being replaced with gravel, rocks, and desert plants. The issue of water conservation is first and foremost.

LUPE MATTHEWS
Sierra Vista, Arizona

Thirsty residents of Sierra Vista and Fort Huachuca are not the only culprits having a negative impact on the area's migratory birds and other local species that depend on the river. Migration of another sort is also damaging the river's fragile habitat. Officials at the San Pedro Riparian National Conservation Area estimate that upwards of 500 undocumented border entrants a day are moving along the river, twice the 100,000 people who visited the river preserve legally last year. Clearly the trash left behind, the trampling of vegetation, and the potential fire danger posed by illegal immigration along the San Pedro contribute to the seriousness of the environmental problem faced by this desert oasis.

JOHN D. JOHNSON
Fort Huachuca, Arizona

After reading your article, my friends and I piled into the car and made a pilgrimage south to the river. Although small by any standards, it was a welcome retreat to our desert-weary eyes. The bad news is that the San Pedro is not only in danger from ranchers and city wells, it is also threatened by endless litter. My friends and I packed out three garbage bags full of trash and passed still more garbage by because our bags were full. It is a tragedy to see something so rare become so abused. I can only hope that others in the area, having seen your article, will visit and pick up trash too.

EMELIE E. BECHER
Tucson, Arizona

The article brought back unpleasant memories about the little river. While stationed at Fort Huachuca in 1954, a buddy and I decided to drive over to Bisbee for the evening. Repair work on the bridge over the San Pedro caused traffic to be diverted off the highway and through the shallow water. We became stuck on a sandbar and walked to a farmhouse down the road to get someone to pull us out. When we returned to where we had left the car, it was gone. A downpour in Mexico had caused a flash flood, and the car was half a mile downstream.

JOE TREADWAY
Claremore, Oklahoma

Nature's Rx

I was pleased to read your article during my recent cross-country flight. This was my first flight in years without Dramamine, Bonine, or the scopolamine patch, all of which I have tried to combat motion sickness. This time I tried the ginger remedy and it worked—all natural and without side effects. A few pills before and during the flight and I was fine.

DIANE M. SIMONELLI
Sparta, New Jersey

As a child in Cuba I had a horrible infection in my eyes. My mother took me to several eye doctors, but in spite of countless medications the infection prevailed. An old lady told my mother to make a tea with the white petals of the rosy periwinkle, drain it through cheesecloth, and cool it in the refrigerator. After three days of washing my eyes with this solution, my eyes went back to normal. Whatever it was, it worked.

ED MOYA
New Orleans, Louisiana

Thank you for recognizing the philosophies of Ayurveda, the ancient medical science from India that makes use of nature's treasures such as turmeric and tulsi in treating problems ranging from the common cold to life-threatening illnesses. However, Western companies have tried to patent antiseptics like turmeric, an element that has been used by a great civilization for centuries. Who are we humans to put a price on nature?

MUKESH R. BHAKTA
Melbourne, Australia

I feel compelled to bring to your attention apparent misinformation regarding the child who was reported to have sustained third-degree burns (page 116). A scalding-water injury rarely results in third-degree burns. Also, third-degree burns do not result in blistering, which is a characteristic of second-degree burns. A child inflicted with this injury and treated in most modern health-care facilities would have a survival rate exceeding 90-95 percent.

LOUIS DELUCA, M.D.
Boca Raton, Florida

I am a naturopathic doctor who uses botanical medicine instead of pharmaceuticals for virtually every patient. Joel Swerdlow accurately addresses some of the potential problems with the scientific scrutiny of herbs: variation in strength with maturity of the plant, time of harvest, etc. But the refrain that scientists are often unable to determine which chemical within a plant is responsible for its actions reveals one of the pitfalls of reductionist science and its quest to isolate, purify, and amplify the effects of a single chemical constituent. Herbs contain a myriad of chemicals that interact to correct imbalances while minimizing side effects. In synthesizing vincristine from the rosy periwinkle, perhaps we have made its action stronger and more directed toward a particular cell line, but you can bet we have also increased its toxicity to the same magnitude.

VICTORIA HAMMAN
Natural Healing Center of San Francisco
San Francisco, California

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JAN TAYLOR, BRUCE COLEMAN (ABOVE); BRIAN ARMSTRONG, NGT

■ EXPLORER, AUGUST 20

Taking the Heat in the Outback

The Australian bush grows even hotter as fire rips through dry vegetation, one of the life-and-death moments facing humans and animals alike in EXPLORER's special edition on Australia.



Host Boyd Matson undergoes his own intense encounter with the outback in this EXPLORER premiere, *The Walk*. With little more than a map and compass, he tackles one of the world's toughest survival courses—a 125-mile trek in the arid Pilbara. The only way to cool off is to soak in a water hole (left). For Boyd, map or not, "the walk was stepping off into the unknown."

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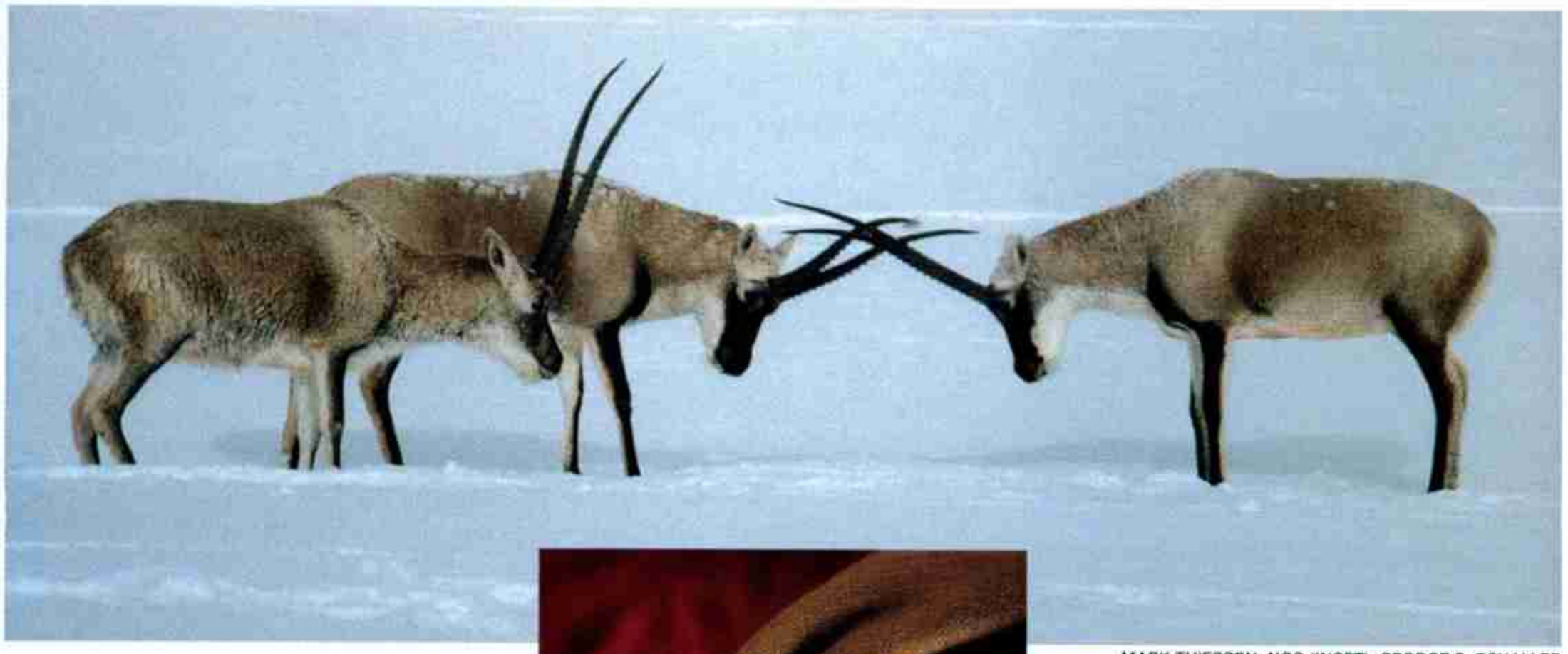
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MARK THIESSEN, NGS (INSET); GEORGE B. SCHALLER

High Fashion Brings Tibetan Antelope Low

Fine enough to slip through a ring (right), shawls made of luxurious wool called *shahtoosh* have been prized for centuries. But demand threatens the source—chiru, or Tibetan antelope (GEOGRAPHIC, August 1993). It takes at least three antelope hides to make one six-foot shawl, which may fetch as much as $17,000 in a high-fashion shop in the West. By some estimates 20,000 chiru are killed each year. "There may now be no more than 75,000," says Wildlife Conservation Society (WCS) zoologist George Schaller.

The trade was banned in most of India in 1977 but remains legal in Kashmir, where the shawls are made. A two-year ad campaign has fashion buyers running for cover. Last year dozens of New York socialites reportedly were subpoenaed for information about their shawls. "In the U.S. they're now sold only on the black market," says Stephen Sautner of WCS.



BRUCE DALE

Fill 'Er Up With a New Additive—Alcohol?

Adding oxygen to gasoline makes it burn cleaner, especially in older cars. Today a third of U.S. gasoline contains an oxygenating agent, methyl tertiary butyl ether, or MTBE. But leaking underground tanks have tainted groundwater with MTBE, so the EPA is moving to phase it out.

What's next? Likely ethanol—ethyl alcohol—mainly made from midwestern corn. But, says Janet Hathaway of the Natural Resources Defense Council, "California would need the most ethanol, which would have to be hauled by truck—expensively."

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Avandia, along with diet and exercise, helps improve blood sugar control. It may be prescribed alone, with Glucophage® (metformin HCl tablets), or with sulfonylureas, such as Amaryl® (glimepiride tablets) and Glucotrol XL® (glipizide).

I am stronger

In studies, the most common side effects included cold-like symptoms and headache. A small percentage of people experienced anemia and/or mild to moderate swelling of their legs or ankles. If you experience these or other symptoms, talk to your doctor.

When taking *Avandia* with a sulfonylurea you may be at risk for low blood sugar. Ask your doctor whether you need to adjust your sulfonylurea dosage.

If you are a premenopausal woman who is not ovulating, you should know that *Avandia* therapy may result in resumption of ovulation, which may increase your chances of becoming pregnant. Therefore, you may need to consider birth control options. Talk to your doctor before taking *Avandia* if you are nursing, pregnant or thinking about becoming pregnant.

While taking *Avandia*, follow your doctor's guidelines for periodic liver monitoring. If you experience nausea, vomiting, stomach pain, tiredness, anorexia, dark urine or yellowing of the skin, talk to your doctor immediately. Also, talk to your doctor if you experience shortness of breath or an unusually rapid increase in weight. Tell your doctor if you have a history of congestive heart failure or edema. Please see important patient information on the following page.

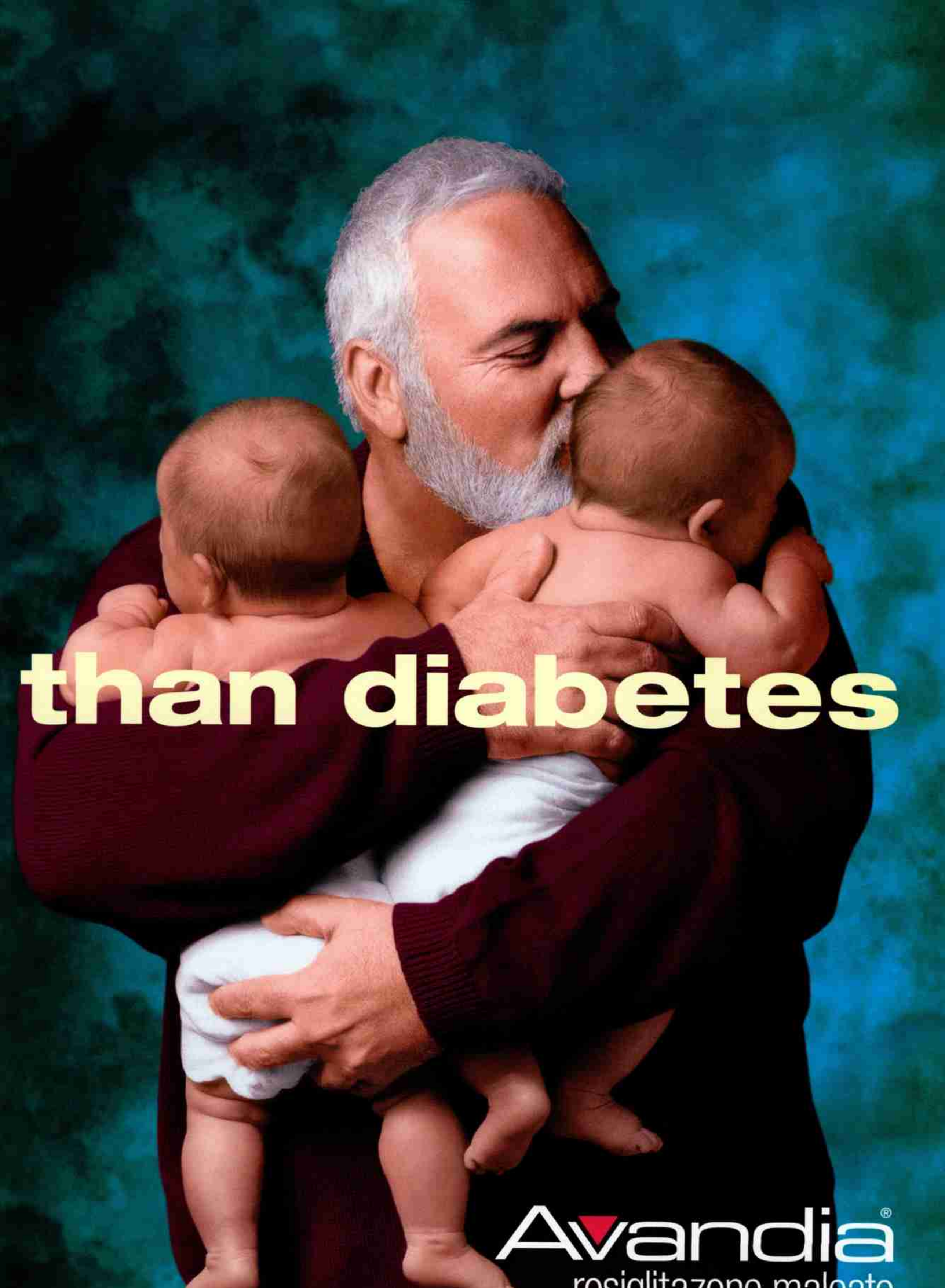
For improved blood sugar control, follow the diet, exercise, weight-loss and medication plan recommended by your doctor and test your blood sugar regularly.

If you have type 2 diabetes, talk to your doctor.
Or for more information, call 1-800-AVANDIA.
www.avandia.com

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Patient Information About AVANDIA® (rosiglitazone maleate) Tablets 2 mg, 4 mg, and 8 mg

What is *Avandia*?
Avandia is one product in a new class of prescription drugs called thiazolidinediones (thigh-a-zoe-lid-een-die-owns). It is used to treat type 2 diabetes by helping the body use the insulin that it is already making. *Avandia* comes as pills that can be taken either once a day or twice a day to help improve blood sugar levels.

How does *Avandia* treat type 2 diabetes?
If you have type 2 diabetes, your body still produces insulin but it is not able to fully use the insulin. Insulin is needed to allow sugar to be carried from the bloodstream into many cells of the body for energy. If insulin is not being used correctly, sugar does not enter the cells very well and builds up in the blood. If not controlled, the high blood sugar level can lead to serious medical problems, including kidney damage, blindness and amputation.

Avandia helps your body use insulin by making the cells more sensitive to insulin so that the sugar can enter the cell.

How quickly will *Avandia* begin to work?
Avandia begins to reduce blood sugar levels within 2 weeks. However, since *Avandia* works to address an important underlying cause of type 2 diabetes, insulin resistance, it may take up to 12 weeks to see the full effect. If you do not respond adequately to your starting dose of *Avandia*, your physician may increase your daily dose to improve your blood sugar control.

How should I take *Avandia*?
Your doctor may tell you to take *Avandia* once a day in the morning or twice a day in the morning and evening. It can be taken with or without meals. Food does not affect how *Avandia* works. To help you remember to take *Avandia*, you may want to take it at the same time every day.

What if I miss a dose?
<u>If your doctor has prescribed *Avandia* for use once a day:</u>

- As soon as you remember your missed dose, take one tablet anytime during the day.
- If you forget and go a whole day without taking a dose, don't try to make it up by adding another dose on the following day. Forget about the missed dose and simply follow your normal schedule.

<u>If your doctor has prescribed *Avandia* for use twice a day:</u>

- As soon as you remember the missed dose, take one tablet.
- Take the next dose at the normal time on the same day.
- Don't try to make up a missed dose from the day before.
- You should never take three doses on any single day in order to make up for a missed dose the day before.

Do I need to test my blood for sugar while using *Avandia*?
Yes, you should follow your doctor's instructions about your at-home testing schedule.

Does *Avandia* cure type 2 diabetes?
Currently there is no cure for diabetes. The only way to avoid the effects of the disease is to maintain good blood sugar control by following your doctor's advice for diet, exercise, weight control, and medication. *Avandia*, alone or in combination with other prescription drugs, may improve these other efforts by helping your body make better use of the insulin it already produces.

Can I take *Avandia* with other medications?
Avandia has been taken safely by people using other medications, including other antidiabetic medications, birth control pills, warfarin (a blood thinner), Zantac® (ranitidine, an antiulcer product manufactured by Glaxo Wellcome Inc.), certain heart medications, and some cholesterol-lowering products. You should discuss with your doctor the most appropriate plan for you. If you are taking prescription or over-the-counter products for your diabetes or for conditions other than diabetes, be sure to tell your doctor. Sometimes a patient who is taking two antidiabetic medications each day can become irritable, lightheaded or excessively tired. Tell your doctor if this occurs; your blood sugar levels may be dropping too low, and the dose of your medication may need to be reduced.

What should I discuss with my doctor before taking *Avandia*?
You should talk to your doctor if you have a history of edema, liver problems or congestive heart failure, or if you are nursing, pregnant or thinking of becoming pregnant. If you are a premenopausal woman who is not ovulating, you should know that *Avandia* therapy may result in the resumption of ovulation, which may increase your chances of becoming pregnant. Therefore, you may need to consider birth control options.

What are the possible side effects of *Avandia*?
Avandia was generally well tolerated in clinical trials. The most common side effects reported by people taking *Avandia* were upper respiratory infection and headache. As with most other diabetes medications, you may experience an increase in weight (3 to 8 pounds). This often occurs with improved blood sugar control. *Avandia* may also cause edema and/or anemia. If you experience any swelling of your extremities (e.g., legs, ankles) or tiredness, notify your doctor. Talk to your doctor if you experience shortness of breath or unusually rapid increase in weight.

Who should not use *Avandia*?
The following people should not take *Avandia*: People with type 1 diabetes, people who experience yellowing of the skin with Rezulin® (troglitazone, Parke-Davis), people who are allergic to *Avandia* or any of its components and people with diabetic ketoacidosis.

Why are laboratory tests recommended?
Your doctor may conduct blood tests to measure your blood sugar control. In addition, your doctor may conduct liver enzyme tests. *Avandia* did not show signs of liver problems in studies. However, because a related drug (*Rezulin*) has been associated with such problems, and because *Avandia* has not been widely used, your doctor may recommend a blood test to monitor your liver before you start taking *Avandia*, every 2 months during the first year and periodically thereafter.
It is important that you call your doctor immediately if you experience nausea, vomiting, stomach pain, tiredness, anorexia, dark urine, or yellowing of the skin.

How should I store *Avandia*?
Avandia should be stored at room temperature in a child-proof container out of the reach of children. Store *Avandia* in its original container.

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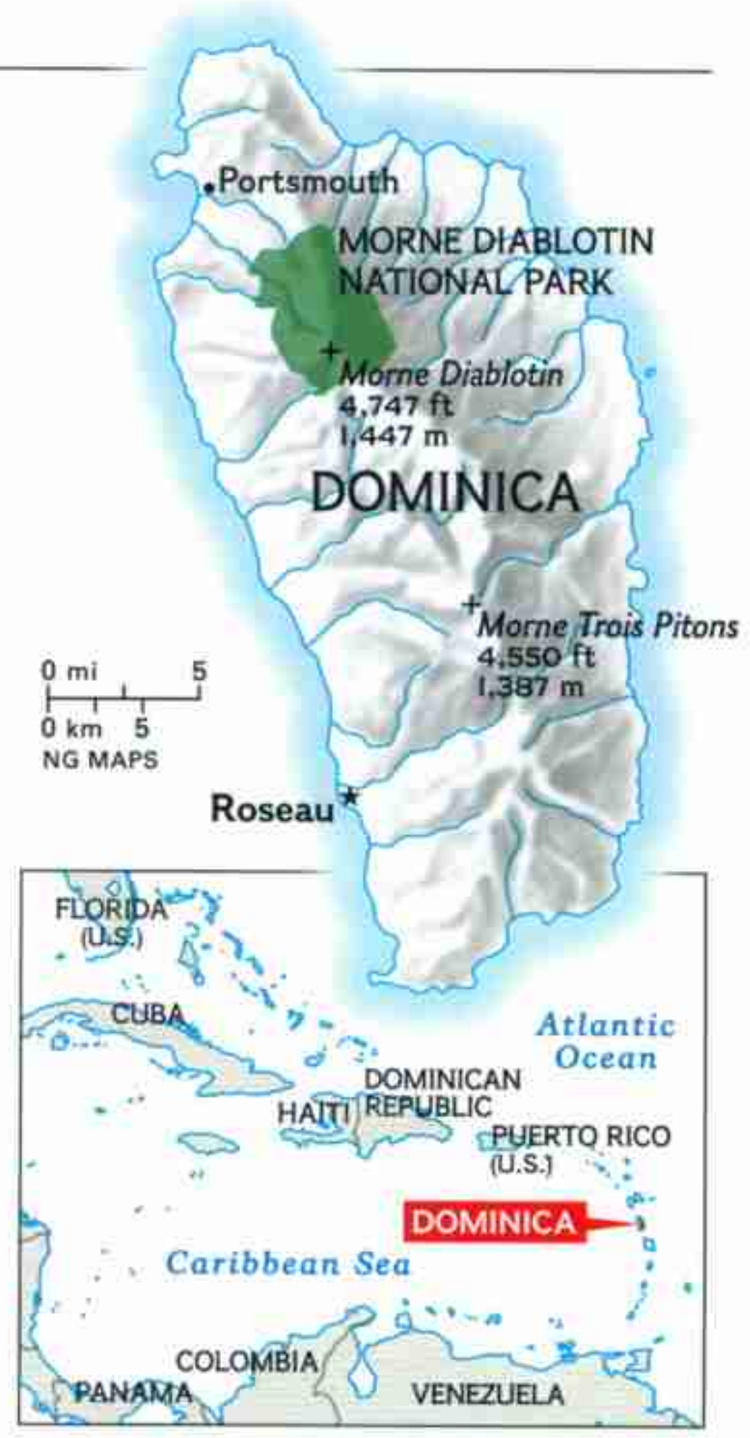


BRUCE DALE (ABOVE); BARRY MANSELL

A Parrot's Friends Dig Deep to Help Save It

National symbol of Dominica, the sisserou parrot now numbers at most 200 on the Caribbean island. To protect its oceanic rain forest habitat, Dominica has set aside 8,242 acres—4.4 percent of the country—as Morne Diablotin National Park.

Before the park's scheduled approval last January, one private 1,301-acre parcel still was needed, and time was running short. To help the Dominican government buy it, a small Florida nonprofit, the Rare Species Conservatory Foundation, contributed $750,000—and temporarily went into debt, says director Paul Reillo.



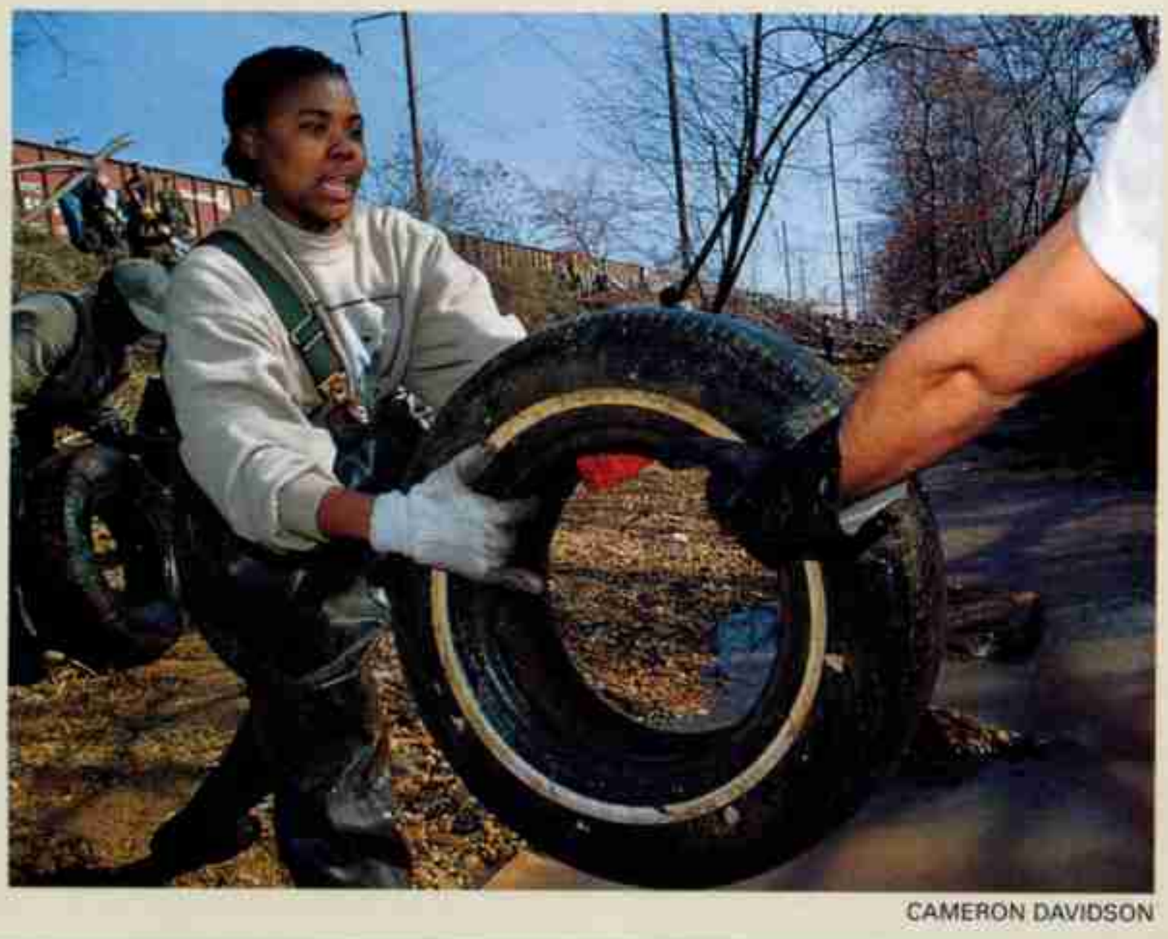
Salamanders' Future Cloudy Amid Drought

Flatwoods salamanders have lost more than 80 percent of their pine flatwoods habitat to timber growers, farmers, and urban developers. About 50 small populations remain, scattered across northern Florida, Georgia, and South Carolina. The species was declared threatened in April 1999.



With federal protection came a buffer zone: Development must remain 1,500 feet from a salamander breeding pond. Several Florida projects, including a new school and a subdivision, have missed deadlines or changed plans as a result.

Meanwhile drought in Florida has kept ponds dry. The salamanders stay buried, no one knows where, and the impact of the new regulations is unclear.



CAMERON DAVIDSON

Helping Hands Aid the Anacostia, a River Abused

Eighteenth-century seagoing vessels sailed the Anacostia River through Washington, D.C., and docked at the East Coast's second largest port, Bladensburg, Maryland. The port is gone, and now silt chokes the river. "The watershed is nearly paved over, and storm runoff is unchecked," says Bob Nixon, founder of Earth Conservation Corps (ECC). Last February someone dumped 600 old tires into an Anacostia tributary, prompting ECC volunteer Roshawn Thompson to help tackle the mess.

TEXT BY JOHN L. ELIOT

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NATIONAL GEOGRAPHIC



PABLO CORRAL-VEGA

From the Editor

MACHU PICCHU has always been special to the Geographic. Dazzled by reports from archaeologist Hiram Bingham, the Society in 1912 cosponsored the first excavation of the Inca ruins. The next year we devoted nearly an entire issue to the site—and since then generations of visitors have followed in our footsteps. It is therefore with mixed emotions that we hear the Peruvian government has endorsed a plan for a cable car to the mountaintop. Critics complain it would bring far too many tourists, harming the fragile structures and creating a theme-park atmosphere. But it would also eliminate environmental damage done by buses that now claw their way up the steep access road. Hard choices haunt the keepers of Machu Picchu and other World Heritage sites. Whether spawned by tourism or war, as seen in this month's article on Angkor, perils of the present can wreak havoc on relics of the past. People must find ways to both share them and care for them.

Bill Allen

Sydney



Skies erupted at midnight over Sydney Harbour, welcoming Y2K with a fireworks blitz as big as all Australia. "This is a huge year for Sydney," says Lord Mayor Frank Sartor, set to host the Olympic Games in September. "It's going to be fire-works all year long."

ON TOP OF

THE WORLD DOWN UNDER



Sydney

By BILL BRYSON

Photographs by ANNIE GRIFFITHS BELT

SOMETIME IN THE LATE 1950s or early 1960s—no one can quite agree when—a remarkable thing happened in Sydney, Australia. The city discovered its harbor. Of course it had been known for some time that the center of the city contained 21 square miles of deep, usable water—hard to overlook something like that—but it seems hardly to have occurred to anyone that this fjordlike intrusion had a certain superlative potential as an amenity.

"It was mostly just a kind of impediment really, something that had to be crossed to get from one side of the city to the other," recalled Deirdre Macken, a Sydney journalist and old friend, of her childhood days in the city in the 1960s. "Some people sailed on it, and there were a few small beaches scattered around, but mostly it wasn't something you were drawn to for pleasure. It was just sort of there."

Then, one after another, Sydney discovered lots of other things that were just sort of there—broad and congenial parks, neighborhoods that felt like neighborhoods, miles of superb ocean beaches, a culturally diverse populace that presented a heady possibility of cosmopolitanism. It wasn't that these had entirely escaped attention either, but no one had noticed that they had a certain ensemble quality: Taken together they had the capability of making Sydney one of the world's most engaging and livable cities.

They're noticing now. These days Sydney basks in a glow of self-generated confidence. With an enviable climate, outstanding restaurants, an almost pathological commitment to culture, a booming economy, and the excitement of the coming Olympics, Sydney has the air of a place whose moment has come.

It is almost impossible to imagine now, when Sydney enjoys more or less universal adulation, that there was a time not so far back when few thought of it as particularly special. Sydney wasn't the jewel of the antipodes but merely the Big Smoke—a rather dull, grimy, hardworking, provincial, not notably attractive metropolis. Melbourne, in an Australian context, was the seat of culture, refinement, and power.

Layabouts on Bondi Beach celebrate Christmas, Sydney style: "No worries, mate!" says Helen Rhodes, third from left, an English elf on her way around the world whose stopover in Sydney turned into "some of the best months of my life."

"It's rather telling that in 1956 the Summer Olympics went to Melbourne and that in 2000 they have gone to Sydney," said Roger Johnstone, Deirdre's husband. The three of us were dining at a popular and pricey harborside Asian-Australian restaurant called Wockpool, where the chef at the time of my visit rejoiced in the gloriously multicultural name of Kylie Kwong—a history of modern Australia in itself.

"No one would have dreamed of awarding the games to Sydney in 1956," Roger went on. "The place was dead after five o'clock in the evening. There was practically no theater or nightlife. The pubs shut at 6 p.m. It was nearly impossible to get a really good meal." He gave me a big smile. "Things have rather changed, wouldn't you say?"

Indeed they have. Wockpool enjoys a prime position in the heart of Darling Harbour, a 2.4-billion-dollar (U.S.), 160-acre cluster of shops, restaurants, museums, convention centers, and airy plazas spread around an 11-acre arm of the harbor along the western edge of the central business district, or CBD, as Australians call their downtowns. Once a busy cluster of wharves lined with wool warehouses, machine sheds, a



railroad marshaling yard, and other productive but unsightly clutter, Darling Harbour began to decline in the 1950s and grew increasingly derelict. In 1988, when the first phase of development opened, it was the first time in 150 years that the public had access to a significant part of the harborfront.

Today 15 million people a year come to Darling Harbour to shop, eat, stroll, visit Sydney Aquarium or the National Maritime Museum, or otherwise take advantage of what is a hugely successful public place. Stretching away from us along the harbor's eastern side stood a complex of stylish bars and restaurants called Cockle Bay Wharf, which at a stroke had recently added 3,100 seats to Sydney's already lively dining scene. There on open-air decks crowds of mostly young, tanned, and clearly prospering patrons were sipping esteemed Australian wines and dining on food spanning the range of gustatory possibility from French and Malaysian to mod-Oz (Oz being short for Australian, of course). Thirty years ago you might with effort have found a glass of Australian Shiraz in the city, but none of the rest—alfresco dining at harborside, a locally inspired cuisine, even female chefs—would have existed.

Pedestrian-friendly downtown is known for "urban suburbs" like Paddington, a once shabby area transformed into one of the city's trendiest neighborhoods. A collection of communities, greater Sydney covers more than 1,450 square miles.

"Just 10 or 12 years ago you would have seen hardly a soul in the CBD in the evenings," observed Deirdre. "There was no reason to come into the city at night. There was nothing to do."

"So what happened?" I asked.

"That," said Roger, nodding at the quietly lapping water. "We discovered that."

FOR ALL SYDNEY'S OTHER VIRTUES, it is the harbor without question that makes the city. Although it covers only a fraction of metropolitan Sydney's 1,450-plus square miles, for a good many of Sydney's four million people the harbor is a constant presence. Because it continuously wanders off into back bays and hidden coves, its shoreline extends 150 miles, most of it fetching, much of it incomparable.

BILL BRYSON's book on Australia, *In a Sunburned Country,* has just been published by Broadway. In her 20 years of assignments for NATIONAL GEOGRAPHIC magazine, ANNIE GRIFFITHS BELT has photographed cities from Vancouver to Jerusalem.

Until quite recently, if you had suggested to me that the day would come when I would long to trade places with a person who spends his days conveying fare-paying members of the public back and forth across a sheltered body of water, I believe I would have given you a small smile and urged you to step up the medication. But that was before I met Andrew Reynolds. A cheerful fellow in his early 30s, with that air of imperturbable capability that seems to be innate with Australians, Reynolds pilots Sydney ferryboats for a living. You won't find a happier person in uniform.

"Look at my office," he said by way of explanation, indicating the view from the bridge of the large and old-fashioned *Lady Herron*, a 550-passenger vessel whose plump lines bespeak a certain plodding elegance. For the past 20 minutes we have been moving through the tranquil waters of Mosman Bay, a boat-cluttered cove enclosed by steep hills of dense woods and peeping houses, but now, as we round a headland called Cremorne Point, we are met by open harbor and a view of celebrated splendor.

Ahead, across a half mile of diamond-bright water, stands the Sydney Opera House, dazzling in the sunshine and jaunty as a clipper ship under full sail. Off to the right is the soaring might of the Harbour Bridge—the Coat Hanger, as it is affectionately known to Sydneysiders. Between and behind these two landmarks rises a backdrop of skyscrapers of a scale and newness that tell you this is a city on the go, and the whole is contained beneath a dome of flawless blue sky. Every object on the landscape—every house, jetty, jutting headland, and leafy green island—fits comfortably, looks exactly right. I asked Andrew if he ever tired of this view.

"No," he responded with unshakable certitude. "There is always something new on or around or even under the water. I saw three whales the other week. Just out there." He pointed toward a point called Bradleys Head. "One of them swam right under the boat. Well, you never get tired of something like that."

He gave a small toot of horn to a pleasure boat motoring slowly toward the Harbour Bridge. Glancing over his shoulder, the owner took on the confounded expression of someone who finds 300 tons of metal coming his way. Andrew gave a patient nod.

"Small craft can be very unpredictable," he said. "A lot of them aren't used to moving about among big ships. They don't always appreciate that boats like this aren't terribly maneuverable. It takes 50 seconds to stop this thing."

"How long?" I asked.

He smiled at my concern.







Leaving spectator boats in their wake, passenger ferries churn across Sydney Harbour in the Great Ferry Boat Race, held annually on January 26, Australia Day. This national holiday marks the landing of the first British convict ships here in 1788.



"You get a lot of momentum with 300 tons of ship underneath you, even at ten knots, so you have to be thinking ahead all the time. But don't worry. I've done this before."

Clearly there was more stress in this line of work than his laid-back demeanor suggested—a point that became clearer five minutes later when we arrived at Circular Quay, the main terminus for the city's many ferries. With what seemed the most modest and casual down-throttling, we berthed in a preposterously tight space without so much as a bump. A couple of hundred passengers got off and a couple of hundred more got on, and we were off again.

I spent the morning shuttling back and forth across the harbor—from Circular Quay to Taronga Wharf and from the quay to Mosman Bay—and I can't tell you how much I envied the people for whom such a charming mode of transport was routine. After our third run Andrew shut down the engine, and we left to go our separate ways—he for a lunch break, I to explore the city.

"I'll miss these old boats," he said as we stood on the quayside.

"How do you mean?" I asked.

"Oh, they're phasing them out. All the old-fashioned ferries like this are going to be replaced with catamarans. The cats are faster, but they haven't got the same elegance, you know, and they're not nearly as fun to pilot. But that's progress, I guess."



Macho makeover: A boatload of Aussies show their feminine side on Australia Day, when costumed spectators line the docks and cruise the harbor cheering for the ferryboats—and poking fun at the bloke in the mirror. "We Sydneysiders don't take ourselves too seriously," observes journalist Mark Collier, "and we've never been shy about showing it."

EVERYWHERE IN SYDNEY these days, change and progress are the watchwords. Scarcely a corner of the city—scarcely a corner of a corner—seems to have escaped the march of improvement and redevelopment. Much of the boom, as you would expect, is attributable to the preparations for next month's Olympics. More than two billion dollars has been spent on the games themselves, principally on Sydney Olympic Park at Homebush Bay, to the west of the CBD. Over 3.6 billion dollars of general construction has risen across the city, including more than 20 new hotels as well as offices and apartment buildings beyond counting.

But something more than just the Olympics is going on here. En route to toppling Melbourne from its undisputed prominence, Sydney has become a truly global city. Its futures exchange is now the biggest in the Asian market, and its branch of the Australian Stock Exchange—once smaller than Melbourne's—trails only Tokyo and Hong Kong in the region. Sydney has become a magnet for international businesses, two-thirds of which now choose it for their Australian headquarters.

Perhaps nothing better encapsulates all that has happened in the city in recent decades than the happy fate of a once obscure piece of real estate beside Circular Quay on a headland called Bennelong Point. Named for a native Australian who was one of the first to befriend the British settlers when Sydney was a forlorn and nascent penal colony in the late 18th century, Bennelong Point enjoys a waterside setting that seems made for grandeur. Yet well into the 1950s the city could think of no better use for it than as the site of a state-run tram garage. Finally in the mid-fifties, motivated at least in part by envy of Melbourne's being awarded the Olympics, the city decided to



replace the old tram shed with a performing arts center. An architectural competition was announced, and a group of local dignitaries was impaneled to judge the entries.

Unable to agree on a winner, the committee sought the opinion of Eero Saarinen, the renowned Finnish-American architect, who sorted through the entries and selected a design by a little-known Danish architect named Jørn Utzon. It was a bold conception, involving a cluster of daringly soaring roof vaults. Although the committee had already rejected the design in favor of a shortlist of much more cautious offerings, it reversed itself and Utzon was given the commission. Because of the near impossibility of building such a top-heavy structure, it took almost 14 years to complete and swiftly overran cost estimates. Utzon himself resigned in 1966 in a dispute over artistic differences and, though now a consultant on future design needs, has never been back. Despite the tribulations, Sydney unveiled the completed structure to the world in 1973. It was, of course, the Sydney Opera House, and it is recognized universally as one of the great buildings of the 20th century.

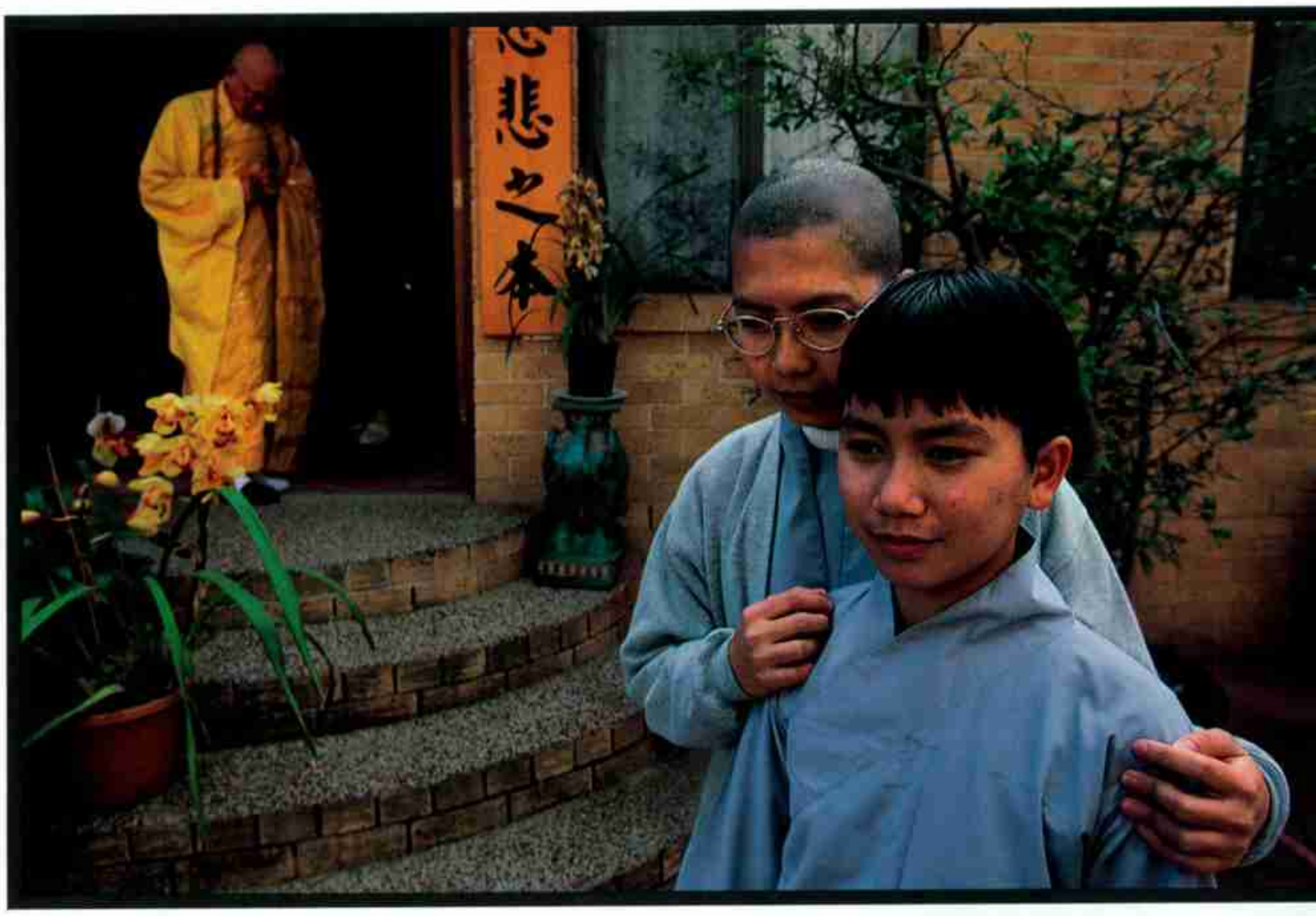
"Probably never before has a single building done more to change a city's perception of itself," said Michael Lynch, the irrepressibly enthusiastic head of the Opera House. "Plus it brought people to the harbor at last. Almost everything that's happened along the waterside in Sydney stems from that."

Considering the immense affection with which the Opera House is regarded by locals and visitors alike, Lynch's principal challenge is a little unexpected—namely, getting more of the people who walk around the Opera House to come inside.

"People hear the words 'Opera House' and think maybe it's a little grand and forbidding," Lynch said. In fact the *(Continued on page 18)*

Sydney has become

Transformed in a generation from a parochial city to a model of cultural diversity, Sydney wears an Asian face in suburbs such as Wetherill Park, where Vietnamese Buddhists founded the Phuoc Hue Temple (right). Sydney's Arabic community preserves Muslim traditions in schools like Noor Al Houda Islamic College (bottom).





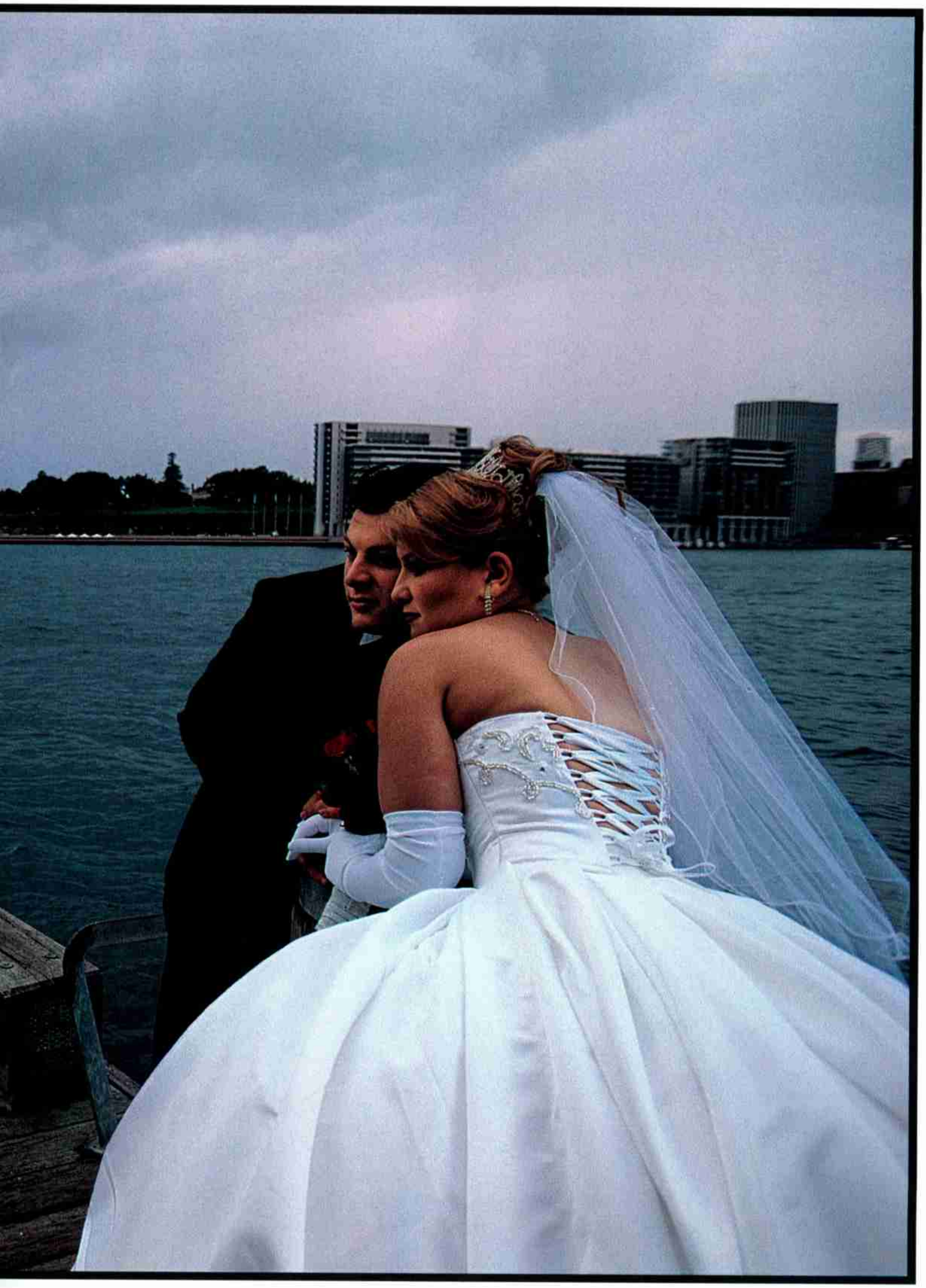
a truly global city.





While tending the identities of its various groups, Sydney also manages to pull them together. "It's a great mix," says Paul Furlong, headmaster of St. Mary's Primary School in Manly (top). "Having kids from different backgrounds makes for a richer education." At a parade celebrating the nation's victory in World Cup cricket, the spirit of Sydney was 100 percent Australian.





Upholding a local tradition, newlyweds pose for pictures on the harbor with the Sydney Opera House behind. Taking their vows with a Lebanese accent, Rose Hamed, at right, and her brother Samir, far left, married Hashem Hamed and his sister, Eman.

"House," as Lynch and most other employees affectionately call it, is about much more than just opera. Although the 1,500-seat Opera Theatre is indeed one of the busiest operatic chambers in the world, the Opera House contains four other theaters and puts on a range of events—over 3,000 every year—from movies and pop concerts to plays and performances of contemporary dance.

But there is one type of event the Opera House has never staged and about which Lynch and his colleagues are very excited. "We're the site of the opening competition of the Olympics—the triathlon," Lynch said. "Sydney's never had the eyes of the world on it all at once before, so the city is very excited but also a little nervous. It's certainly the biggest thing ever to happen here."

If carefulness of preparation is any guide, then the Olympics and the Paralympics that follow will be games to remember. When I traveled to Homebush Bay, ten miles from the CBD, to visit Olympic Park, it was still ten months till the games would begin, but already the site was up and running. Hundreds of people strolled along Olympic Boulevard, gazing at the new stadiums and buildings.

"We've had 20 million visitors already," said Elsie Hasting, an ebullient young official of the Olympic Co-ordination Authority. "That's more than the population of Australia. Before the Olympics have even started, this place is a success."

To illustrate her point, she took me to the Aquatic Centre, a gleaming white edifice where the swimming events will be held. Half the center contained competition and training pools, but the other half was given over to a vast leisure pool, complete with fountains, slides, and whirlpools—all being used by throngs of visitors, more than seven million so far. "You see what I mean?" Elsie said, beaming. "This isn't just a place for competitive swimmers. It's a place for everybody. That's one of the differences about this Olympics; nearly all the facilities are designed to have separate, ongoing uses after the games. One other thing. Sniff the air and tell me what you smell."

I sniffed. "Nothing," I said.

"Exactly. There's almost no chlorine used. The water's scrubbed with special filters. I can't pretend to understand the technology, but I can tell you it's part of a very comprehensive commitment to making this the greenest Olympics yet. Nearly every facility, including the athletes' village, is the most energy efficient of its type ever built for an Olympics."

As we proceeded through the park, she told me about the environmentally friendly touches that had been employed—an emphasis on natural lighting and ventilation, the use of recycled water, the planting of 200,000 trees around Olympic Park.

"This land was originally divided between a brick pit, a racetrack, and an abattoir," she said. "Twenty thousand animals a day were slaughtered here. Then it all became derelict. Nobody wanted to live around it. Now we get the pleasure of staging the Olympics, we acquire world-class facilities for future use, and we regenerate a declining area of the city." She looked around the area with real fondness. "From wasteland to wonderland," she said.

Not everyone is quite so unreservedly ecstatic. "We're still unhappy about a couple of things," said Rupert Posner of the environmental group Greenpeace. "In particular the Olympic authorities haven't cleaned up the waters of Homebush Bay in the way we had hoped. There are still elevated levels of dioxin in the bay's sediments, for instance, but on balance they have done a pretty good job. Overall we gave them a B minus in our last assessment."

I TOOK A CAB back into the city. It was driven by a delightfully chipper man named Tony Boumelmem, who told me he had come to Australia from Lebanon 27 years ago. Sydney, like urban Australia generally, is an amazingly diversified place. Almost a third of the people in the city were born in another country. A quarter of the city's residents speak a language other than English at home. I asked Tony what had brought him here.

"I was just 17 and wanted to see the world, you know? So I came here and got a job in a factory. I didn't speak a word of English."

"How did you manage to work in a factory?"

"The foreman, he made signals with his fingers. In this one factory you had people from maybe ten, twelve different countries, all speaking different languages. That's what Sydney was like then."

"So you're happy here?"

"It's a beautiful bloody country—beautiful. Great weather. Lovely lifestyle. Plenty of

Sydney

HOST OF THE 2000 SUMMER OLYMPIC GAMES

NATIONAL GEOGRAPHIC SOCIETY

Home today to four million people, Sydney was founded as a far-flung penal colony for the British Empire in 1788, when the first fleet of convict ships landed at what is now Circular Quay. A rough-and-tumble port for much of its history, Sydney has been transformed in the past few decades into one of the world's most alluring cities, where a multitude of nationalities have made a home for themselves and become, in the process, Australian.

PARALYMPIC GAMES

The flame of the Paralympics ignites in Olympic Park in October for 4,000 world athletes with disabilities. Among the 18 events are four sports, such as wheelchair rugby, unique to these "parallel Olympics," first held in Rome in 1960.

THE ROCKS

Sandstone crags where the first convicts built their huts anchored a ramshackle port that mellowed in the 1930s into a working-class neighborhood with a pub on every corner. The Rocks is a slice of Sydney's checkered past, served up daily to tourists.

SYDNEY HARBOUR BRIDG

Called he Coat Hangefor its slope-souldered designthe Sydney Harbor Bridge openedin 1932. Climbig tours offer views from its arch which peaks 42 feet above he water.

SYDNEY OPERA HOUSE

"Clearly a controversial design," wrote the judges who in 1957 chose the sketches submitted by Danish architect Jørn Utzon in a competition for Sydney's new opera house. Opened in 1973, it endures as Sydney's waterfront trademark.

SYDNEY HARBOUR

Sydney's harbor is renowned for natural deepwater channels. Yet its greatest value may be intangible: "The harbor," writes author Jan Morris, "seems to me less a spectacle than an event . . . a perpetual pageant, punctuated by astonishments."

TARONGA ZOO

A spectacular collection of native and exotic animals looks out over Sydney Harbour. Conservation and research are emphasized, along with displays of animals from wombats to Sumatran tigers.

SYDNEY HARBOUR NATIONAL PARK

This 972-acre reserve is composed of scattered parcels encompassing islands, headlands, and beaches—"all the things about Sydney that make you want to get up early," says one resident.

SYDNEY OLYMPIC PARK
ARCHERY
BADMINTON
BASEBALL
BASKETBALL
DIVING
GYMNASTICS
HANDBALL
HOCKEY
MODERN PENTATHLON
SOCCER
SWIMMING
SYNCHRONIZED SWIMMING
TABLE TENNIS
TAE KWON DO
TENNIS
TRACK AND FIELD
VOLLEYBALL
WATER POLO

RYDE WATER POLO

SYDNEY OLYMPIC PARK

OLYMPIC PARK STATION

Sydney International Archery Park

Ryde-Parramatta Golf Course

North Ryde Golf Club

Bicentennial Park

Olympic Village

Concord Golf Course

Hen and Chicken Bay

Cockatoo Island

Spectacle Island

Snapper I.

Goat Island

Balls Head

Iron Cove Bridge

Rodd Island

Iron Cove

Darling Hbr.

Sydney Aquarium

Sydney Hbr. Bridge

Sydney Opera House

CITY CENTRE TRIATHLON

Royal Botanic Gardens

Circular Quay

Australian National Maritime Museum

DARLING HARBOUR
BOXING
FENCING
JUDO
VOLLEYBALL
WEIGHTLIFTING
WRESTLING

Cockle Bay Wharf

Town Hall

Chinatown

Hyde Park

Garden Island

Clarke Island

Bradleys Head

Fort Denison

Cremorne Point

Bennelong Point

Steel Point

Shark Island

Rushcutters Bay

Double Bay

Rose Bay

Royal Sydney Golf Course

Taronga Zoo

Taronga Wharf

Chowder Head

Taylors Bay

Watsons Bay

The Gap

Dunbar Head

Diamond Bay

Georges Head

Middle Head

Grotto Point

Hunters Bay

Dobroyd Head

Quarantine Head

Fairfax Lookout

North Head

Blue Fish Point

Manly Cove

Queenscliff Beach

Manly Beach

The Spit Bridge

Sailors Bay

Long Bay

Northbridge Park Golf Course

Lane Cove

Parramatta

Tasman Sea

PACIFIC OCEAN

Port Jackson (Sydney Harbour)

Sydney Harbour National Park
Other open space
Olympic venue
Railway with station

0 mi 1
0 km 1

SOURCES: LAND INFORMATION CENTRE, NEW SOUTH WALES (BASE MAP); OLYMPIC CO-ORDINATION AUTHORITY; SYDNEY ORGANISING COMMITTEE FOR THE OLYMPIC GAMES
NATIONAL GEOGRAPHIC MAPS

OLYMPIC PARK

This reclaimed industrial wasteland is a study in green environmental design, put to the test for the Sydney Olympic Games. The park's innovations create an Olympics far greener than any in modern history.

DARLING HARBOUR

Sydney's busiest port in the 19th century was once all wharves and cargo. Today it's connected by footbridge to the rest of downtown and features wall-to-wall attractions, from the city's toniest shopping to theaters, museums, and the Sydney Aquarium.

CIRCULAR QUAY

Site of the first British anchorage in 1788, this historic landing is today Sydney Harbour's transportation hub, a combination street theater, railway terminal, and jumping-off place for the thousands of suburbanites who commute via ferry to their jobs downtown.

ROYAL BOTANIC GARDENS

Gardens covering 74 acres were set aside in 1816 by Governor Lachlan Macquarie and thrive as Australia's oldest scientific institution. Besides 7,000 species of plants, the grounds contain a prime vantage point for harbor events: Mrs. Macquarie's Chair, a natural stone bench favored by the governor's wife.

CHINATOWN

Though an 1850s gold rush brought many Chinese to Sydney, the shops and restaurants of today's Chinatown reflect the impact of a wave of emigrants from China and other Asian countries since the 1970s.

FOX STUDIOS

"Australia 2000," an exhibit featuring the work of NATIONAL GEOGRAPHIC photographers as well as historical prints from the GEOGRAPHIC archives, will be displayed at Byron Kennedy Hall, Fox Studios, September 1 through 21.

BONDI BEACH

Symbol of Sydney's laid-back lifestyle, Bondi is a mile-long stretch of sand within cycling distance of downtown. Site of the Olympic beach volleyball competition, Bondi is accustomed to crowds: A good day in summer will draw tens of thousands of people.

METROPOLITAN SYDNEY





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SYDNEY Olympic Park
THE GREEN GAMES

NATIONAL GEOGRAPHIC SOCIETY

DOWNTOWN SYDNEY

HOMEBUSH BAY
The tidal bay next to Olympic Park is nobody's idea of pristine, thanks to by-products of old manufacturing, including Agent Orange. Dioxin levels in the bay's sediments remain among the highest in the world.

TEAR OUT MAP

THE BRICK PIT
When the endangered green-and-golden bell frog was found living in this deserted quarry earmarked for Olympic tennis, plans were revised and the habitat protected. Though concentrated here, the species lives throughout Olympic Park.



BASEBALL STADIUM
The stadium's grandstand roof required 22 percent less steel than conventional designs and channels rainwater into underground tanks for irrigation.

BASEBALL
MODERN PENTATHLON

OLYMPIC PARK STATION
Mass transit is a key innovation at the Sydney Games. Only official cars are permitted on site; all spectators must use public transportation. Part of a 54-million-dollar (U.S.) rail upgrade, this new, state-of-the-art train station will be tested by millions of game-watchers.

DOME AND PAVILIONS
BADMINTON
BASKETBALL
GYMNASTICS
HANDBALL
MODERN PENTATHLON
VOLLEYBALL

OLYMPIC BOULEVARD
Lighting this boulevard are 19 powerful solar towers. All sidewalks and plazas are covered with "eco-paving"—perforated tiles through which storm-water runoff is collected. Treated, the runoff will irrigate new surrounding parklands.

SYDNEY INTERNATIONAL AQUATIC CENTRE
Opened in 1994, this facility was designed to be green, with a groundbreaking ozone filtration system that cuts the use of toxic chlorine in pools 60 percent.

DIVING
MODERN PENTATHLON
SWIMMING
SYNCHRONIZED SWIMMING
WATER POLO

SYDNEY INTL. TENNIS CENTRE
TENNIS

NEW SOUTH WALES STATE SPORTS CENTRE
TABLE TENNIS
TAE KWON DO

SYDNEY INTL. HOCKEY CENTRE
HOCKEY

OLYMPIC STADIUM
Site of opening and closing ceremonies, this facility uses no PVC plastics in its 110,000 seats, minimal air-conditioning, and only rainwater collected on the roof to water the playing field. Like other venues its construction was an exercise in sustainable environmental practices.

SOCCER
TRACK AND FIELD

SYDNEY SUPERDOME
All the Superdome's energy comes from renewable sources, including solar panels on the roof. It was built with recycled materials—steel, timber, and concrete. Even the dome itself is recycled—insulated with enough recycled paper to fill 65,000 Sydney phone books.

BASKETBALL
GYMNASTICS

MAIN PRESS CENTRE

SYDNEY INTL. ARCHERY PARK
ARCHERY

WATER WORKS
All the nonpotable water used during the games—for irrigation and flushing toilets, for example—will come from rainwater or recycled sewage. The sewage is double treated by biological processes and pumped (via non-PVC pipe) to every facility in Olympic Park.

KRONOS HILL
One of the big problems facing organizers was disposal of a century's worth of rubbish and industrial waste. One solution: landfills such as Kronos Hill, an 82-foot landscaped mound where low-level toxic waste is stored under three feet of earth. Runoff is collected and treated.

ANNIE GRIFFITHS BELT (SYDNEY OLYMPIC PARK); BOB PETERS, OLYMPIC CO-ORDINATION AUTHORITY (FROG)

SOURCES: GREENPEACE AUSTRALIA, OLYMPIC CO-ORDINATION AUTHORITY, SYDNEY ORGANISING COMMITTEE FOR THE OLYMPIC GAMES

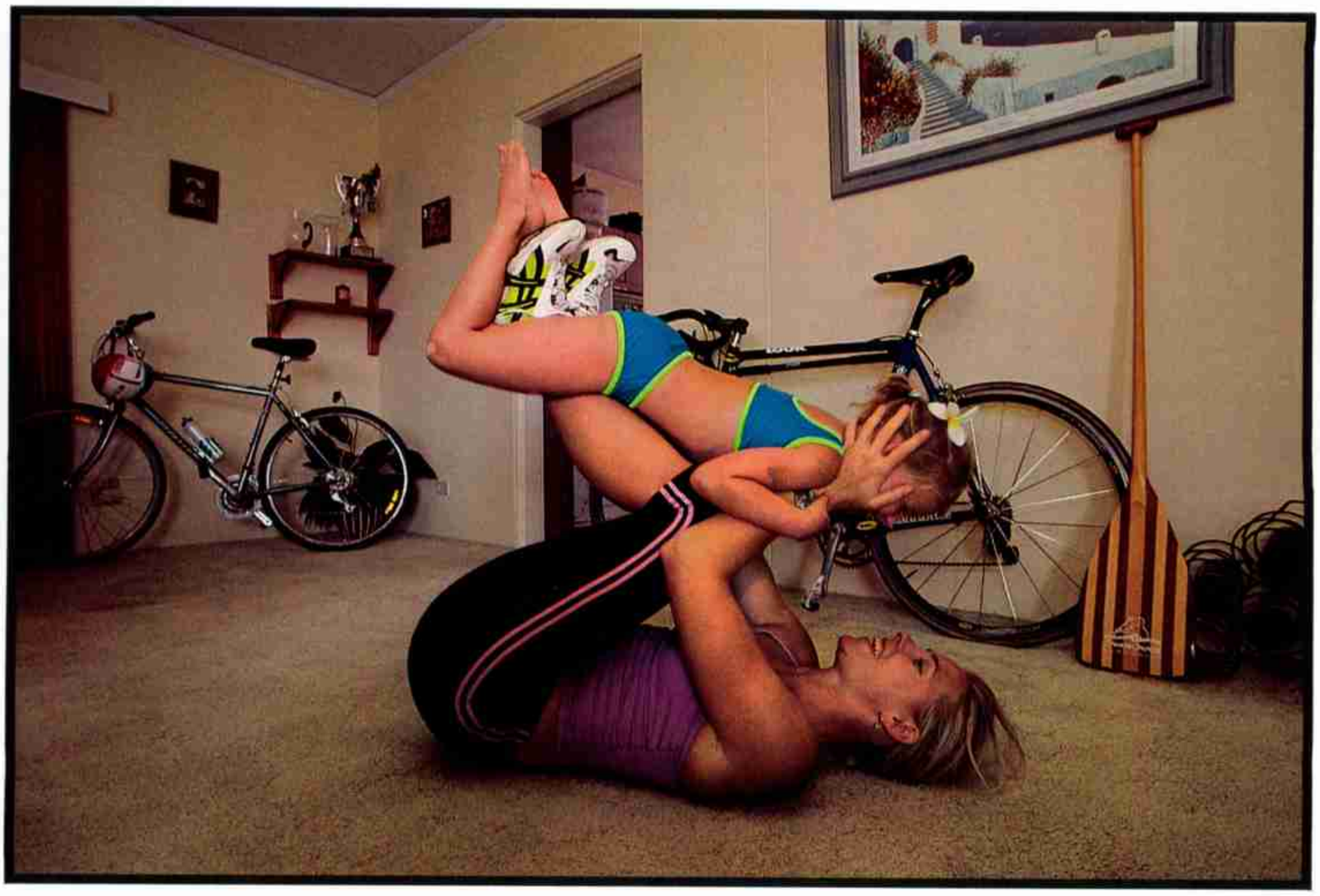
As recently as the 1970s Homebush Bay, site of the Olympic Games in Sydney, was the kind of industrial no-man's-land that most people went out of their way to avoid. For more than a century these tidal wetlands had served the city as a combination rubbish dump and factory zone, used by tenants ranging from the state slaughterhouse and brickworks to the naval arms depot. "When I was growing up here, you thought twice about taking a deep breath outdoors," recalls Judy Harrington, a 53-year-old naturalist. "These days I look around and I can't believe my eyes."

In its bid to host the Olympic Games, Sydney committed itself to producing a "green" Olympics at a reclaimed Homebush Bay, designed by the state government in partnership with the environmental organization Greenpeace. Working together, these groups laid out strict guidelines related to global warming, ozone layer and biodiversity protection, the avoidance of toxic materials, and the management of waste, water, and energy—and lived up to them more fully than many thought possible.

OLYMPIC VILLAGE
Largest solar-powered suburb on Earth, the athletes' housing was built with environmentally sound materials such as plantation timber and nontoxic paint. Most pipes are free of PVCs. The solar-heated units feature a model waste-and-water recycling system and run on energy generated by some 6,000 solar panels.

WASTE MANAGEMENT CENTRE
An emphasis on recycling will be a hallmark of these games, with virtually no nonrecyclable materials used on site. Collected trash will be sorted and taken to a recycling plant or a composting plant.

MAP PRINTED ON RECYCLED PAPER



Olympic hopeful and single mom Nici Andronicus gets help from her daughter, Ashleigh, as she trains for the triathlon by crunching out leg lifts. Injury and illness later took Andronicus out of the running; she will cover the event for Australian TV.

opportunity if you want to work hard. Yeah, it's a beautiful place."

I had reason to reflect on those words a few days later when I found myself seated in a large, high-ceilinged office in the city's Town Hall, a building of ornate Victorian splendor, in the company of the city's lord mayor, Frank Sartor. Few people better illustrate the point about Australia being a land of opportunity.

Sartor's parents came to Australia from Italy—his father in 1949, his mother a year later. Sartor was born in 1951 and grew up in a family of ten on a farm in southwestern New South Wales. He studied chemical engineering at the University of Sydney in the early 1970s and stayed on in the city. Sartor became lord mayor in 1991 as an independent and soon will have held the position longer than anyone else. Sitting in shirtsleeves and a bright tie, Sartor seemed the very quintessence of a Sydney quality I had noted several times before—the ability to be passionate about your work without taking yourself too seriously. I asked him how he explained Sydney's startling rise to prominence.

"My mayoralty," he replied with a deadpan earnestness that quickly gave way to a boyish grin. "Actually it's a lot of things," he went on. "We're connected to Europe and North America culturally, but we're in an Asian time zone, which gives us an advantage. We have a highly educated workforce with a lot of language skills. We also have a first-rate international airport, good communications, and a stable and sophisticated financial system. We have a wonderful climate and attractive lifestyle—good restaurants, nice beaches, an optimistic way of looking at the world that I think outsiders find attractive. Once you develop a critical mass of those things, you find that more and more people want to come and be part of it. I think that's what we are enjoying now—a sense that this is a place whose time has come."

CERTAINLY there is no question that Sydney has become a much more worldly city. As David Dale, a writer and longtime Sydney-watcher, explained it to me: "Fifty years ago we ate British food, read British books, lived unadventurous British lives. If you *(Continued on page 24)*

"We can get up to 60,000

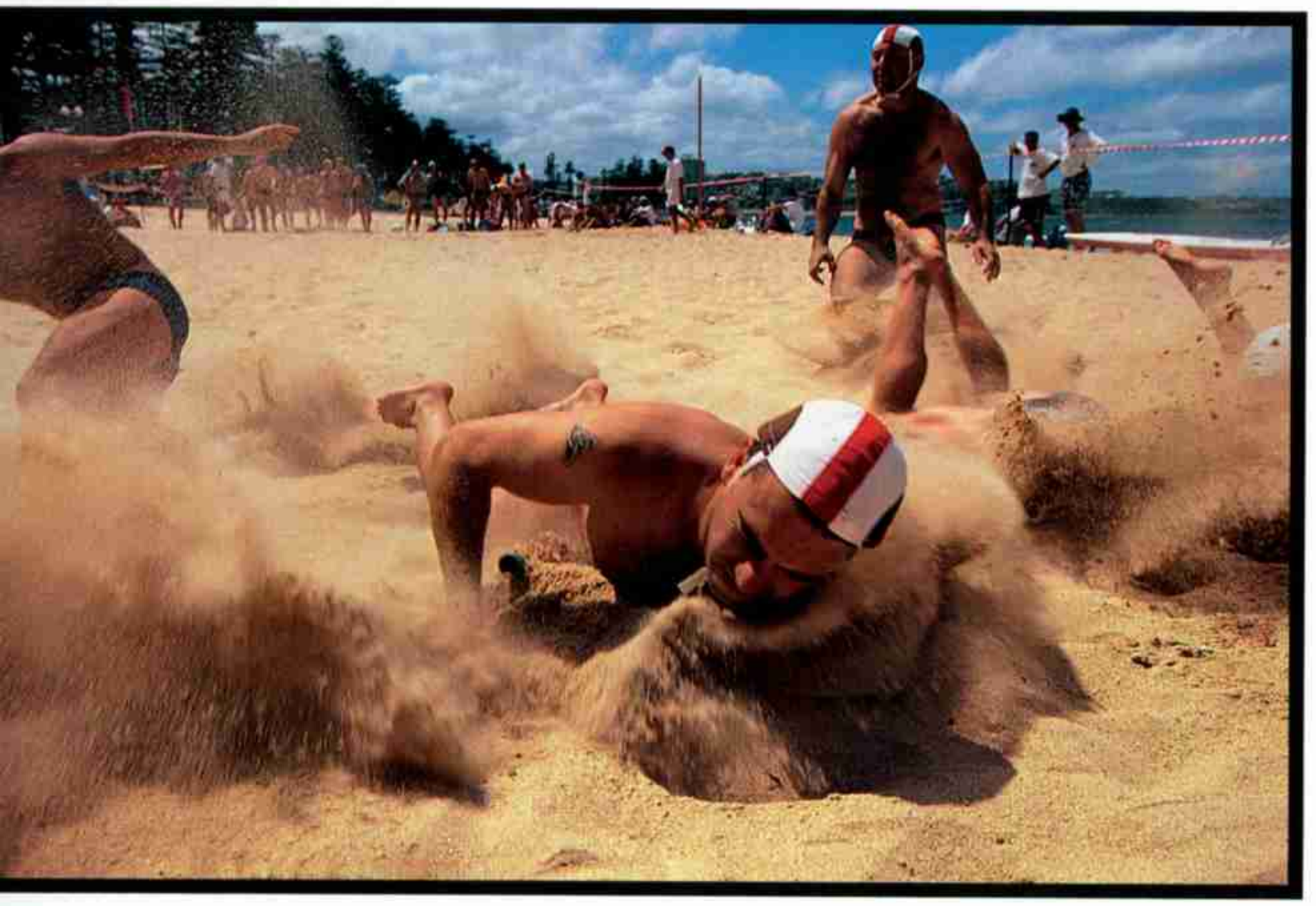
Surf's always up at a mile-long strand of beach (right) shared by adjoining suburbs Manly and Queenscliff, though a snarl of currents can make it treacherous for swimmers. "It's a beautiful beach, easily underestimated," says Peter Daley of the Queenscliff Surf Life Saving Club, which patrols the area on weekends with a staff of 220 lifesavers, most of them unpaid volunteers.



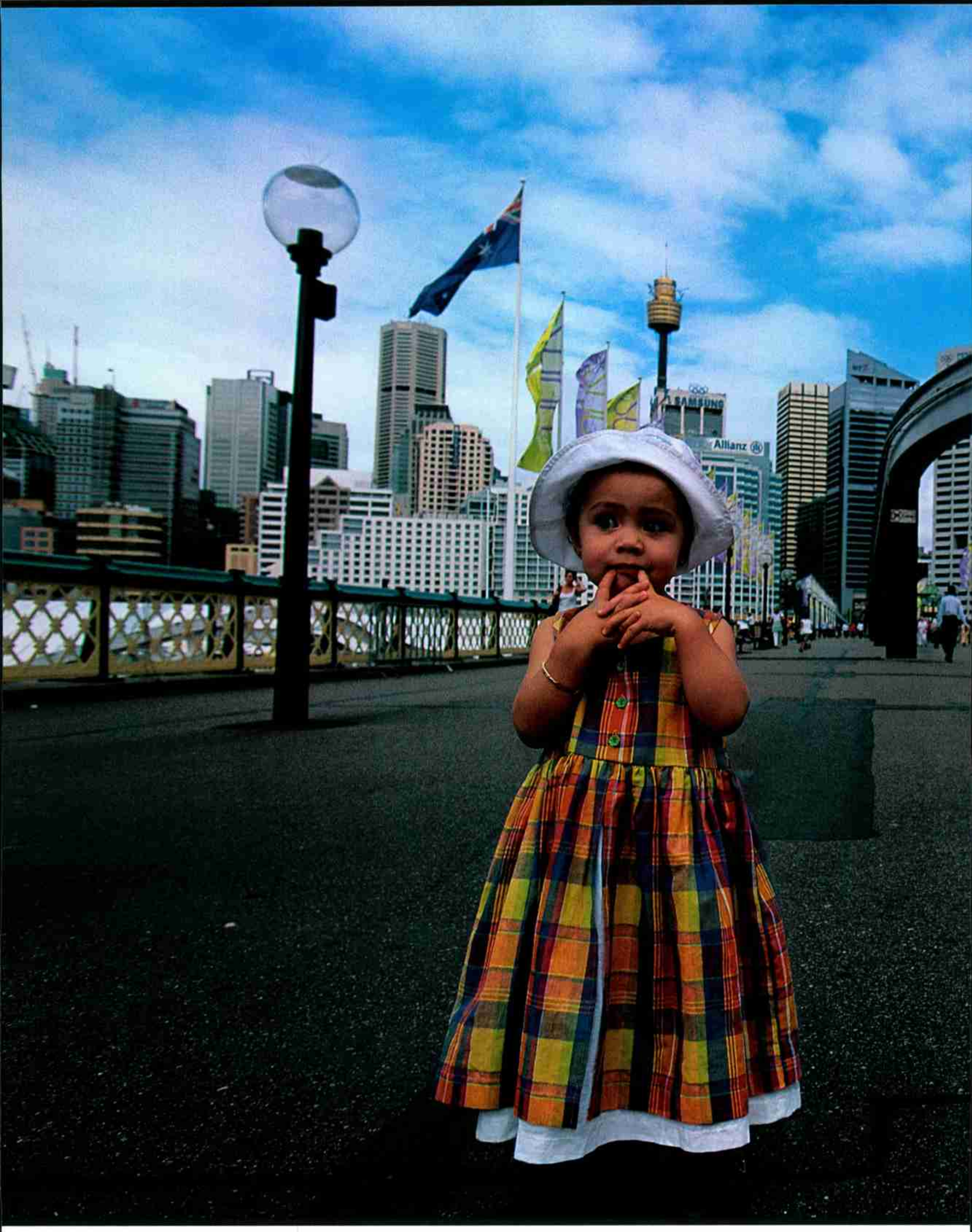


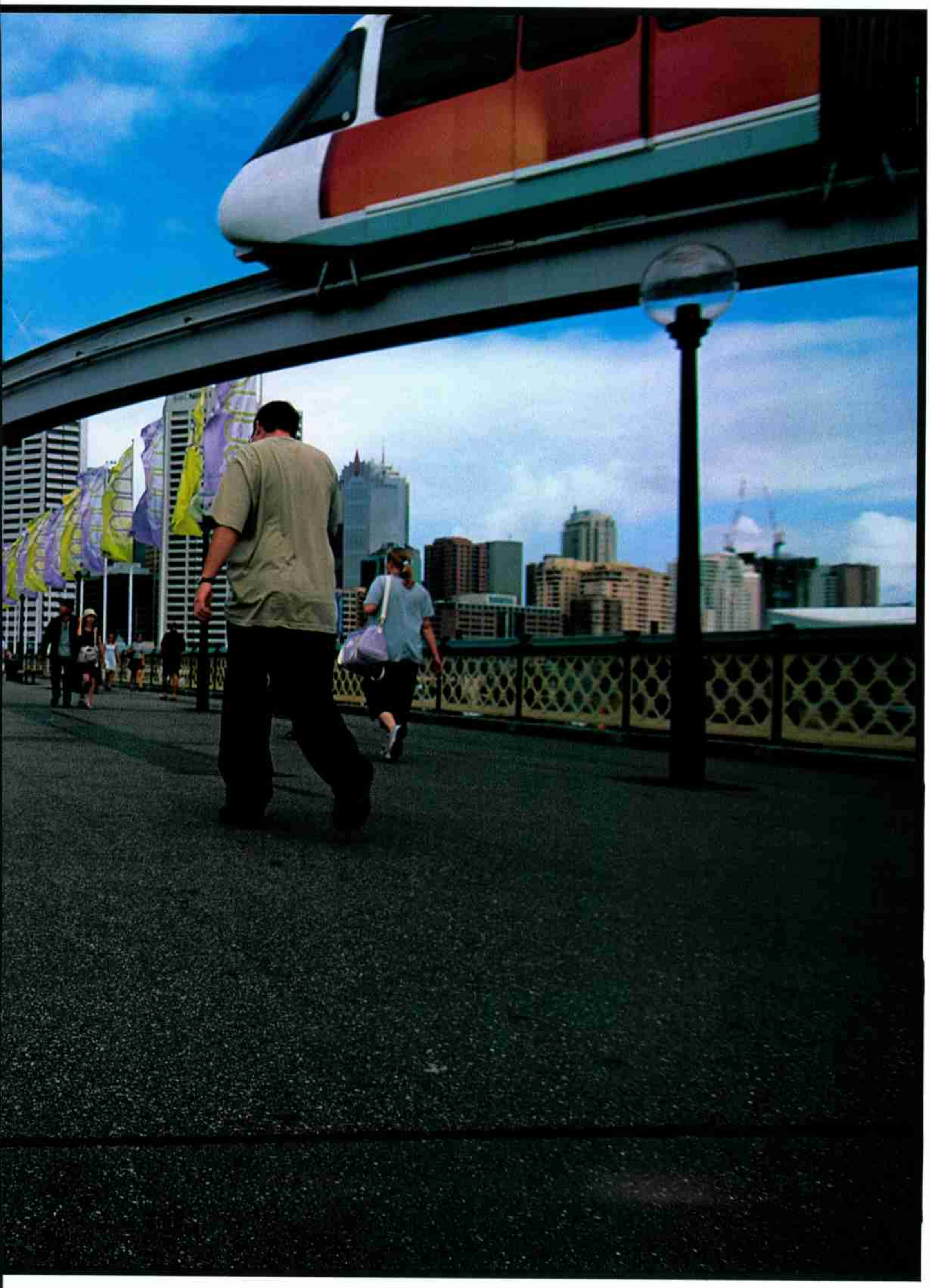
people on the beach on a hot day."





Founded in 1924, Queenscliff is one of three dozen clubs in Sydney that together perform thousands of rescues each year. Their skills are tested at the Queenscliff Surf Carnival. Teams compete in everything from surfboard rescues (top) and surfboat rowing (far left) to an event not unlike musical chairs, in which lifesavers race for batons stuck in the sand (left).


SAMSUNG
Allianz



Country girl Jessica Browne enjoys a trip to Darling Harbour. Her mom, Jeanette, came from Manila four years ago, married an Aussie, and moved to a small town southwest of Sydney. "There's a feeling of electricity in the city right now," she says. "It's a thrill."

had suggested to Australians back then the idea of eating squid"—he was eating squid as he spoke—"they'd have looked at you as if you were mad. Then we had a boom of non-British immigrants, mostly southern and eastern Europeans in the 1950s and '60s, Asians since then. It completely transformed Australia, especially the big cities."

We were sitting in a welcoming, quietly elegant restaurant called Beppi's, named for a welcoming, quietly elegant fellow named Beppi Polese, who came to Australia from Italy as a young man in 1952 and began working in restaurants. Beppi laughed when I asked him what the dining scene was like in Sydney then.

"You wouldn't believe it," he said. "In those days fried chicken Maryland was a sophisticated dish." He shook his head with a degree of wonder that clearly has not dimmed in half a century. "Most Australians had never tasted garlic or field mushrooms or eggplant. If a vegetable wasn't green and spherical, they wouldn't touch it." He paused and raised a finger. "So I took it upon myself to improve their diet."

In 1956 he and his wife, Norma, opened Beppi's on a quiet road near Hyde Park. It is now the oldest continuously owned restaurant in Sydney. I asked him how he got the customers to expand their tastes. "Oh, I cajoled, I begged, I bullied a little. I gave the food away if I had to. But it was hard. I remember once I offered mussels to a very good customer. He took one look and said, 'That's not food. It's bait.' But once I got them to taste the food, they'd often be amazed at how good it was—better anyway than chicken Maryland." He shook his head again, then excused himself to greet some new customers.

With change so ubiquitous in Sydney these days, anything that recalls an earlier, simpler era in the city seems all the more cherishable—and nowhere will you find that better represented than at Bondi Beach, the most famous of the many Sydney beaches strung along the shores of the Pacific. There, since 1906, devoted members of the famous Bondi Surf Bathers' Life Saving Club have been looking after the public. The work is unpaid and voluntary.

"Actually we pay for the privilege of saving lives—30 dollars a year in membership dues," said John Mackey, age 32 and one of about 700 members of the club. An accountant by profession, Mackey spends one weekend in three on average patrolling the mile-long beach as part of a team of 10 to 15 lifesavers.

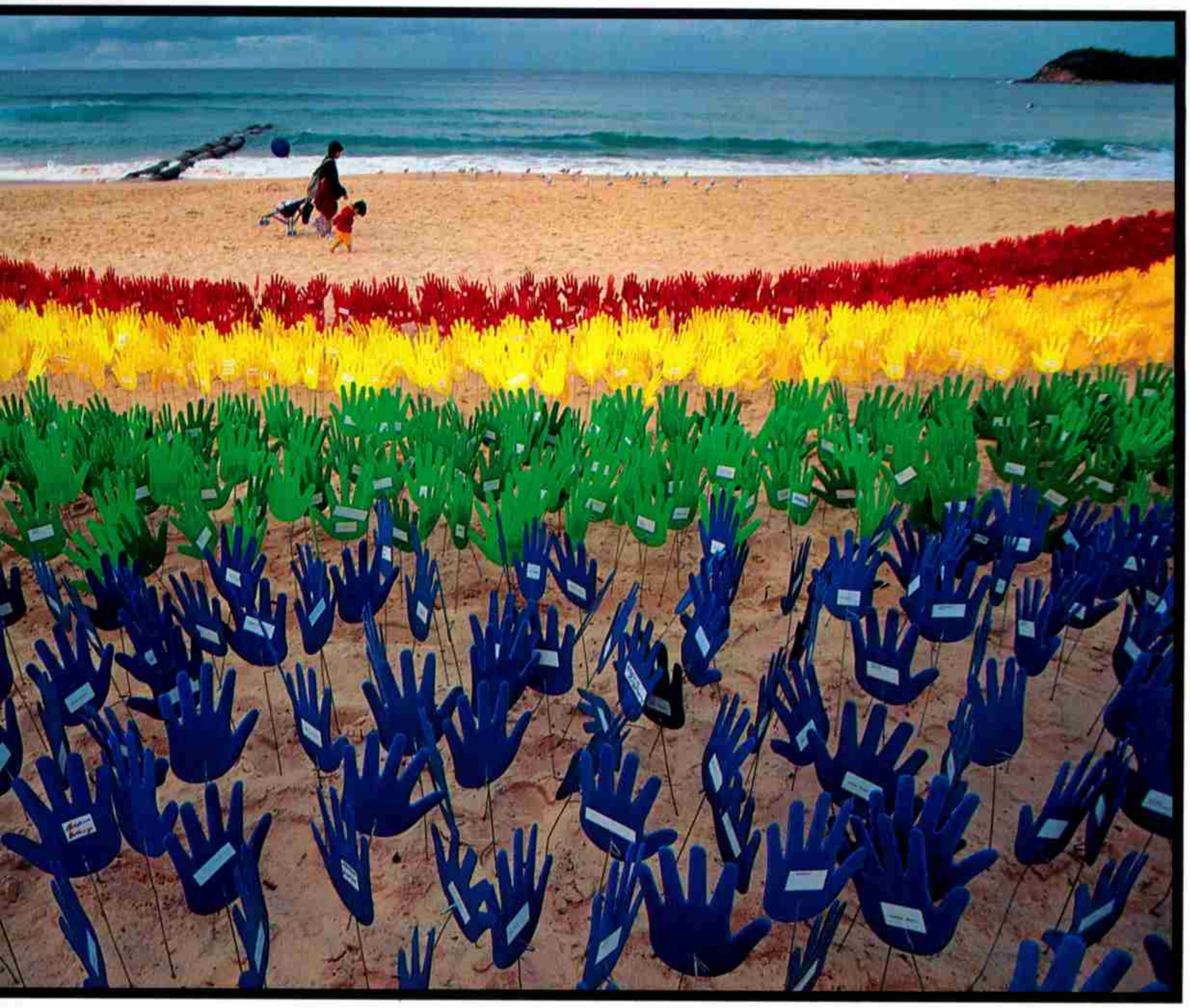


Reaching for reconciliation, plastic hands bear the signatures of some 250,000 Australians who join artist Fiona McDonald in supporting Aboriginal claims to legal rights and land. Called the "Sea of Hands," the traveling sculpture reminds Sydney of unfinished business as it assumes the role it seems born to play: the city of many voices, now on top of the world.

"We can get up to 60,000 people on the beach on a hot day, so as you can imagine, we're confronted with all kinds of things—heart attacks, cuts, bee stings, jellyfish stings, people getting hit by surfboards, you name it. Plus of course we save swimmers in trouble—88 of them last year."

I asked him why he was prepared to devote such a big part of his life to what is, after all, unpaid work. "I see it as an honor," he responded at once. "I love the idea that people have been doing this voluntarily for almost a century. It's a very important tradition in Sydney."

But traditions, alas, are increasingly rare. In its headlong rush to modernity in the 1960s and '70s, Sydney unceremoniously swept aside much of its past, including many of its finest buildings. I asked Shirley Fitzgerald, the city's



official historian, how much the city has lost.

"We've lost about all of it twice," she replied with a wry but weary smile. "In the 1880s, during an economic boom, most of the city's best Georgian architecture was replaced with rather more ornate and showy Victorian buildings. Then in the 1960s and '70s, when we discovered the joys of the skyscraper, we lost much of the Victorian stock."

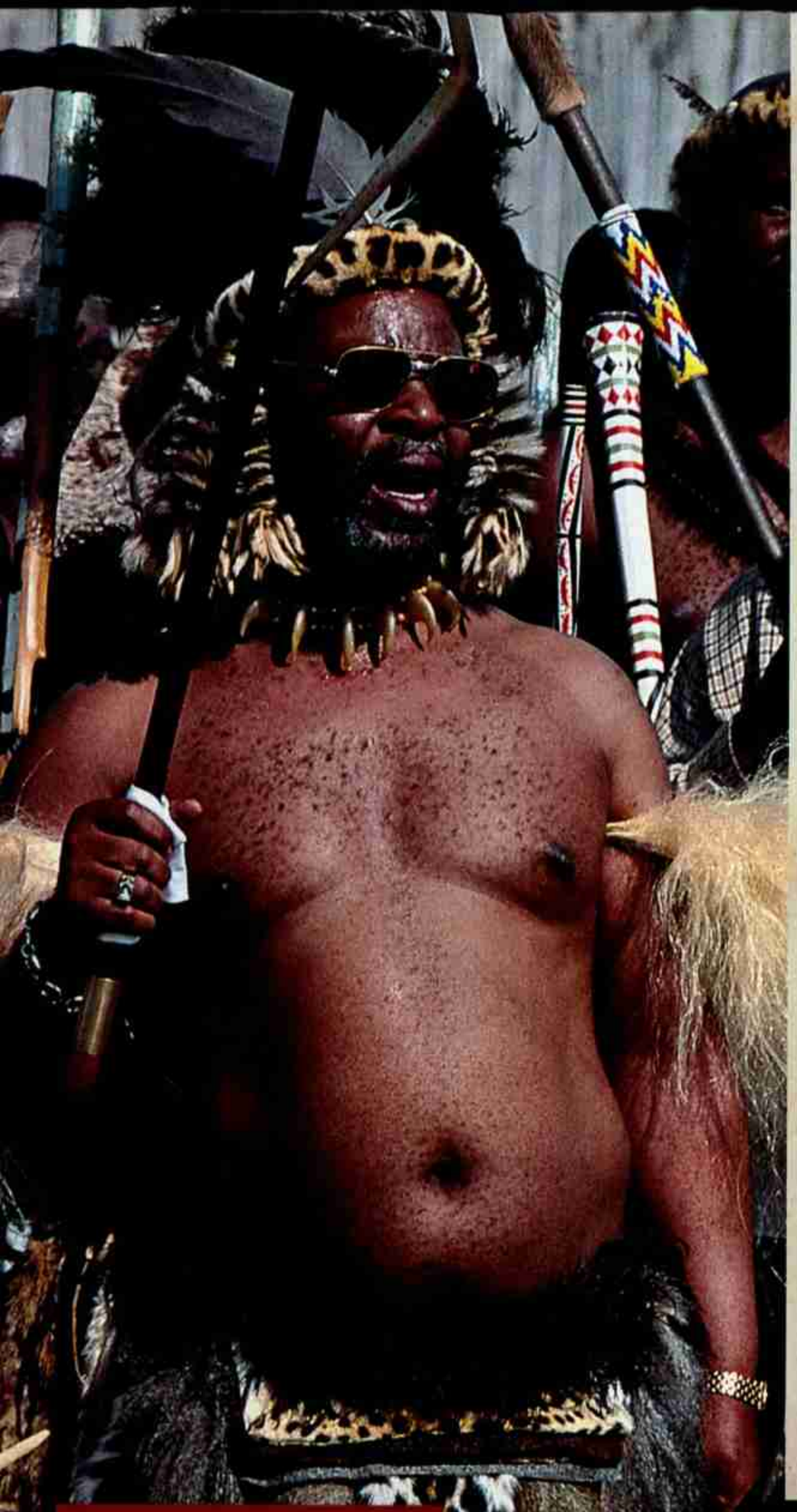
Nowadays Sydney tends to engage in a practice known as facadism in which developers preserve the fronts of Victorian structures but fill the space behind with skyscrapers. The result is that at street level you seem to be in a Victorian neighborhood, but stand back a block or two and the deceit becomes apparent at once. It is, in Shirley Fitzgerald's view, a compromise that serves neither old nor new.

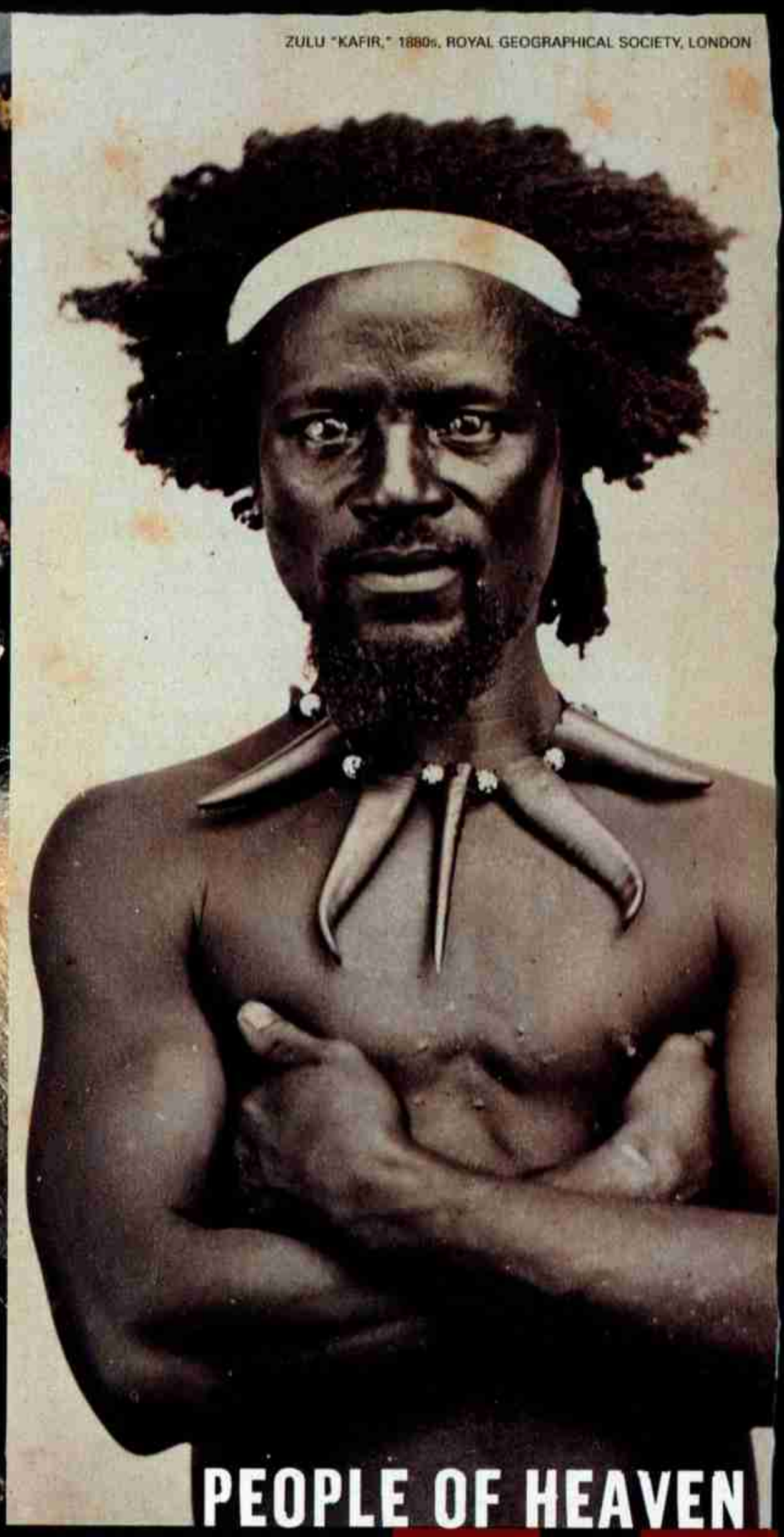
"Sydney is confused about itself," she said. "We can't seem to make up our minds whether we want Sydney to be a modern city on the North American model or an old-fashioned city in the European style. It's a conflict that we aren't getting any better at resolving."

On the other hand, being young and old at the same time has its attractions. I considered this when I met a thoughtful young businessman named Anthony Bertini. "There's a phenomenon here called the cultural cringe," he told me, "which is essentially the belief that we lack culture in this country. What people forget is that the Italians, when they came to Australia, brought 2,000 years of their culture with them. The Greeks brought more like 3,000 years, the Chinese more still, and so on through all the different immigrant groups. We've got a foundation built on ancient cultures but with a drive and dynamism you can only get in a young country. I think that's a pretty hard combination to beat."

He is right, of course. But I can't help wishing they would keep those old ferries. □

Arrayed like this 19th-century warrior (inset), members of the Zulu royal family brandish sticks to defend the honor of the amaZulu, or People of Heaven. The nearly ten million Zulus, who represent South Africa's largest ethnic group, will likely determine whether the country grows in peace or violence.





ZULU "KAFIR," 1880s. ROYAL GEOGRAPHICAL SOCIETY, LONDON

PEOPLE OF HEAVEN

HEIRS TO VIOLENCE

ZULU

S

BY PETER GODWIN

PHOTOGRAPHS BY ED KASHI

PAUL BELLOW was once accused of disparaging African literature by remarking, "Who is the Tolstoy of the Zulus? I'd be glad to read him." There are indeed Zulu Tolstoys, but they belong to an older tradition, that of the oral storyteller. The Zulu tongue is a lilting, lyrical language whose nearly every spoken word is lubricated at either end with a vowel—*iklwa, induna, Isandlwana.* The Zulus are South Africa's most populous nation, with nearly 10 million of the country's 33 million blacks. They are also its most martial nation: In the past 20 years as many as 20,000 Zulus have died in factional fighting. To have any hope of understanding who the Zulus are today, one has to know their flamboyant and gory history, a history with which Zulus remain obsessed and from which they draw strength. And no one tells it better than Prince Galenja Biyela, now well into his nineties. Prince Biyela is a Tolstoy of Zulu oral historians.

I ride on horseback to meet him at Simunye Zulu Lodge. It is deep in Zululand, in the Mfule River Valley, capped by mist. *Simunye* means "we are one," and the camp is an attempt to create a tourist lodge that is both an authentic 18th-century Zulu village and, on the other side of the river, a white pioneer encampment of the same period. There is no running water, no electricity. My luggage comes down the mountain in an oxcart. My laptop is balanced on the head of a sashaying Zulu woman.

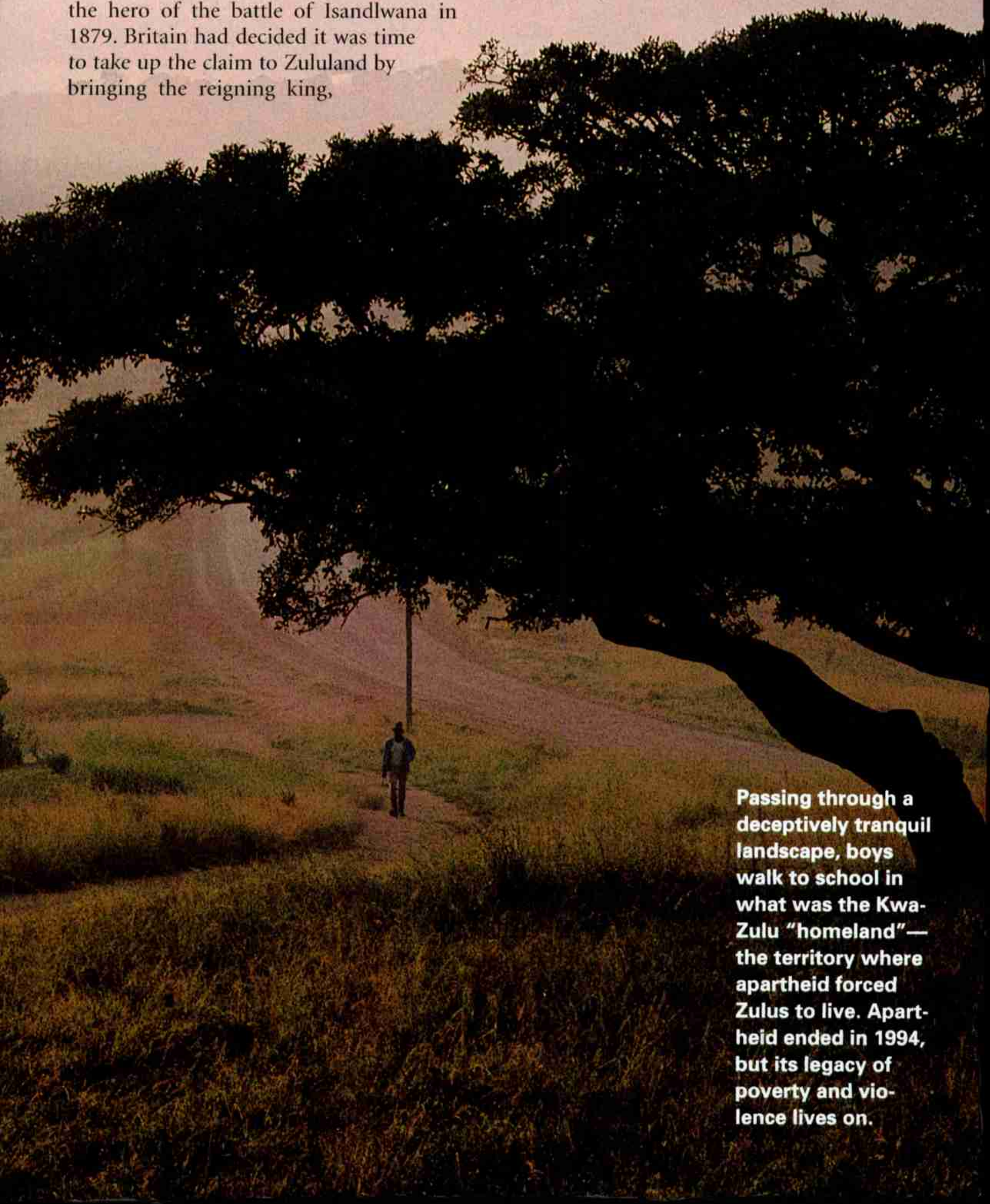
That night around a fire I am introduced to Prince Biyela. He is tall and gaunt and straight-backed, with white hair and beard. Around his shoulders he wears a leopard skin draped so that the tail lies down his chest, like a furry necktie. His long fingers close around the gnarled head of a club as he accepts a proffered chair. He sits, showing nearly a yard of mahogany shin between his old sneakers and the turn-up of his trouser legs.

"All is well," he declares in a perfect English accent. It soon becomes apparent that this is his only English phrase, and he repeats it from time to time in various intonations. We all sit lower than he to show due

respect, and the local Zulus chant his praise name. All senior Zulus have praise names, a curriculum vitae by acclamation.

"You are the bull that paws the earth," they call. This goes back to his warrior days as general of the Pondo Ndlovu—the Tusks of the Elephant—regiment. "Your Highness," they sing, "we will bow down to the one who growls."

Prince Biyela's is an illustrious family, which has spilled its blood frequently in the Zulu nation's short and bloody history. His grandfather Mkhosana—the Prince—of the Black Mamba regiment, was the hero of the battle of Isandlwana in 1879. Britain had decided it was time to take up the claim to Zululand by bringing the reigning king,



Passing through a deceptively tranquil landscape, boys walk to school in what was the KwaZulu "homeland"—the territory where apartheid forced Zulus to live. Apartheid ended in 1994, but its legacy of poverty and violence lives on.

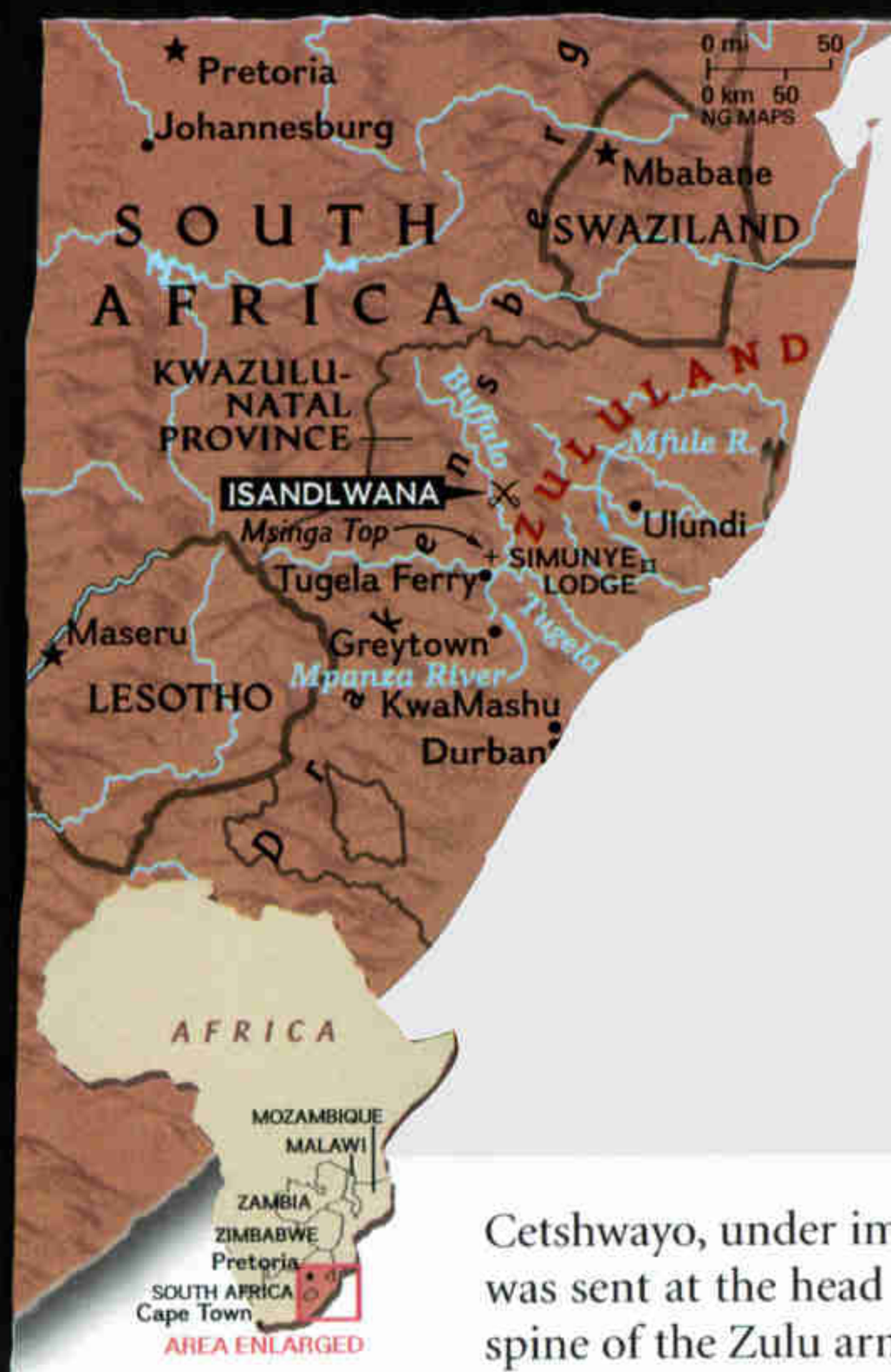


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"BATTLE OF ISANDHLWANA, 1879," NATIONAL ARMY MUSEUM, LONDON

Cetshwayo, under imperial sway. So Lord Chelmsford was sent at the head of a mighty column to break the spine of the Zulu army.

"We Zulus encountered men, real men of the great white queen, the Queen of England," says the prince. "And oral tradition tells us that King Cetshwayo said, 'You will not cross the Buffalo River at your own liking,' and the queen said, 'Of course I will. And I will shoot down your warriors with grapeshot, among other things.' And Cetshwayo said, 'My warriors are as many as the hairs on an ox's back.' And furthermore, he said, 'My warriors will fight for an entire day because they do not need to stop for tea.'" There is a twinkle in Biyela's blurry old eyes.

On the morning of the battle of Isandlwana a British scouting party rode up to the cusp of the slope, and there in the valley below, sitting on their war shields in absolute silence, was the heart of the Zulu army, regiment upon regiment, some 25,000 warriors in all. It was the biggest military force sub-Saharan Africa had ever seen. Lord Chelmsford had made the fatal error of dividing his force, which included many Zulu volunteers, and sending it in different directions to locate the main Zulu army. So it was that the remaining rump of the British force at Isandlwana, fewer than 1,800 men, watched in awe as, with perfectly choreographed precision, the Zulu warriors stepped over the skyline as one man and began to slap their spears against their shields. Then they advanced, chanting all the while and stopping every so often to stomp the ground in unison, sending a tremor through the earth. And as the Zulu warriors advanced, as some tell the story, their places on the skyline were taken by thousands of Zulu women, urging on their army in the traditional way by ululating, an eerie high-pitched keening that filled the air.

"The battle started early in the morning," recounts Biyela, "when the mist was so thick you could see only the tips of the cows' horns. But with the first volley of the British arms, it seemed as if the mist must have taken fright, and it lifted.

Clan fought clan in the early 1800s, when the great warrior Shaka carved out a Zulu kingdom. Then Zulus fought Boers and British (above), who came seeking land, minerals, and laborers. Today violence flares between Zulus in the African National Congress (ANC) and rivals in the Inkatha Freedom Party, such as these men (right) attending the funeral of a slain leader.

PETER GODWIN, who grew up in Zimbabwe, is the author of *Mukiwa: A White Boy in Africa*. This is his first story for the magazine. Photographer ED KASHI, a frequent contributor, covered Pakistan for the October 1997 issue.

"Soon the fighting was very heavy, and a very young regiment, the Bulls with White Faces, facing bullets for the first time, found themselves under withering rifle fire, taking grievous casualties. Their courage began to fail, and many of them lay down on their bellies upon the veld."

After his third glass of the "queen's tears," the Zulu name for Natal gin, Prince Biyela is at his garrulous best. "When the sun was at its zenith, the Bulls with White Faces regiment had been so reduced that it was as small as a sparrow's kidney. A reserve regiment of younger boys who were not supposed to go into battle that day begged their commander: 'Seeing our older brothers dying,' they said, 'makes us like a cow that needs to be milked.' Their commander refused, saying that they were under orders to hold back and that they would be punished if they disobeyed. 'There will be no need to punish us,' the young boys replied, 'for we will die on the field of battle, just like our brothers.' And with that they attacked in such numbers that some of them were able to grab the red-hot barrels of the rifles with their hands and silence them thus."



The battle took just two hours, and more than 1,300 on the British side were killed. Once the battle fell quiet, by some accounts, a great wail was heard at Isandlwana from the ranks of the Zulu women following behind. And this wail moved through village after village until finally it reached the Zulu capital of Ulundi, 50 miles distant.

There Prince Biyela ends his narrative, choosing not to dwell on what followed. For even as the Zulus humbled the imperial British at Isandlwana, so they spent themselves. Their finest hour was shortly followed by their military destruction, as British reinforcements crushed the independent Zulu nation.

THE ZULU WARRIORS STEPPED OVER THE SKYLINE AS ONE MAN AND BEGAN TO SLAP THEIR SPEARS AGAINST THEIR SHIELDS.

TODAY, AFTER HALF A CENTURY of further repression under apartheid, many Zulus feel renewed pride in their history and culture. The resurgence of traditions is noticeable across Zulu society, even among university students who only a few years ago were embarrassed by tribal history and regalia. And the Shembe church, a Zulu version of Christianity whose members wear traditional Zulu dress and mix ancestor worship with Old Testament beliefs, is one of the fastest growing religions in the country.

"One feels that one belongs to a very great people," said Mangosuthu Buthelezi, South Africa's Minister of Home Affairs. Buthelezi is head of the Inkatha Freedom Party—named after the *inkatha yezwe*, a sacred

grass coil that symbolizes Zulu unity. Yet despite the revival of Zulu culture, Zulu unity has proved elusive. The martial past of the Zulus endures in the seemingly endless and deadly political violence that has pitted supporters of the Inkatha party—mostly rural, tradition-minded Zulus—against "modern" Zulus, who support its rival, the ruling African National Congress (ANC). The violence continues to flare up despite peace initiatives, extra policing, and boosted army patrols.

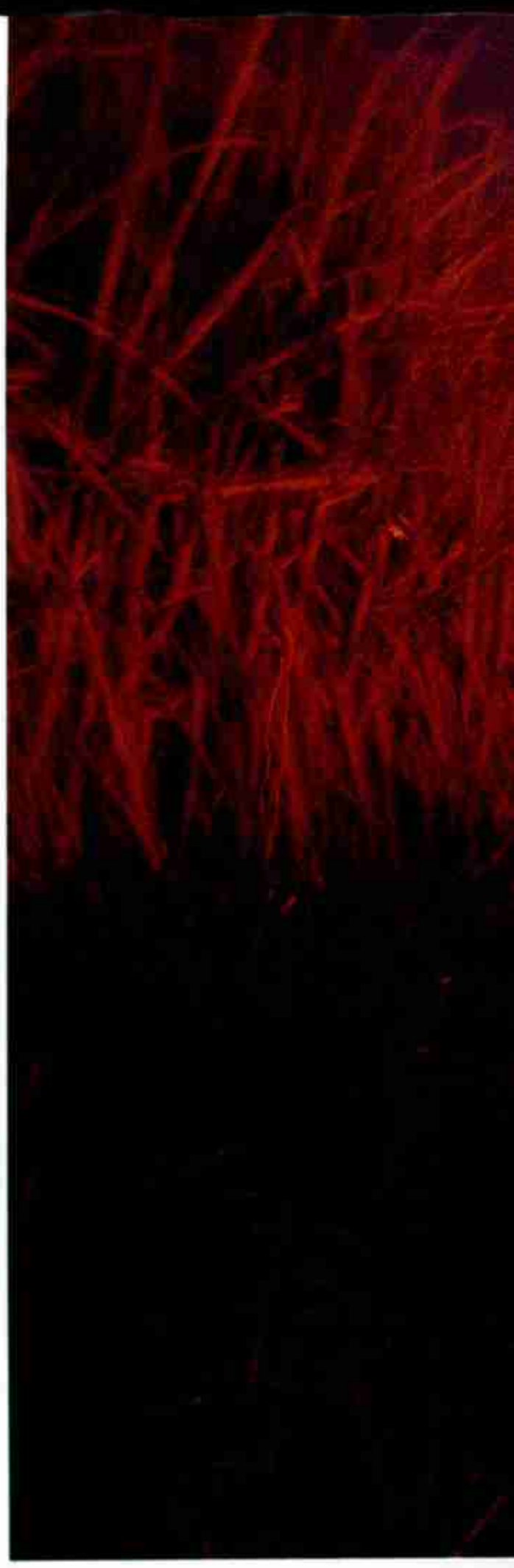
THE DISTRICT OF MSINGA, poor and isolated, as deep into deep Zululand as you can go, is the strongest bastion of inherited Zulu culture. Nearly 60 percent of the people of KwaZulu-Natal Province live in rural areas like this. As you drive from Greytown, in what used to be the old, white-ruled South Africa, through the Mpanza Valley and into what was the old KwaZulu homeland, the avocado, pecan, and macadamia plantations give way to aloes and thorn trees. You wind down the escarpment, and there below is a sweeping view over the green folds and steep valleys of Zululand, dotted with thatch huts and small patches of corn. The tinkle of cattle bells and the call of trumpeter hornbills, a sound like the enraged screech of a cat, drift up from a valley above the distant whoosh of a river.

Msinga means "mountainous," and the whole area is dominated by huge reef upon reef of mountain range, veined with granite and clustered together, intersected with steep valleys that lead down to the rippling brown swell of the Tugela River, a corruption of the Zulu *thukela,* the startling one, so called because of its propensity to burst into flood without warning.

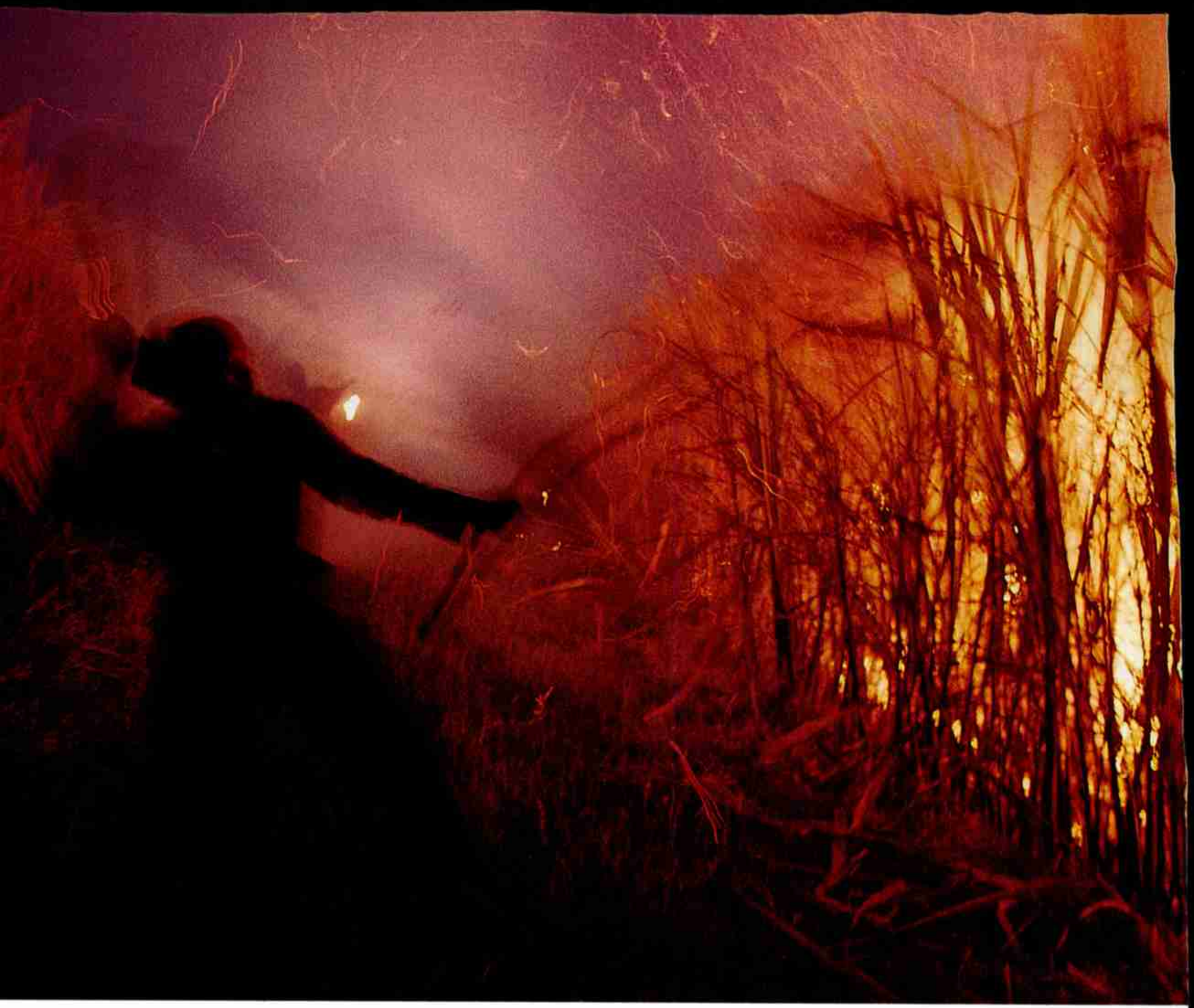
Tugela Ferry, a dusty market town, is the local capital. Its ferry has long since disappeared, replaced by a now antique one-lane iron bridge. The town's single street is lined with makeshift stalls where Zulu women sell vegetables and fruit, traditional beadwork and jewelry, pleated cow-leather skirts and embroidered pinafores, goat offal, skinned cows' heads, corn in husks, and clay pots and gourds. Many married women still wear the *isicolo*—the traditional large conical headdress woven from their own hair or, increasingly today, from hair extensions stretched over a grass frame. Their pleated leather skirts are wound several times around their waists, giving the appearance of Victorian bustles. Their faces are caked with red clay to protect them from the sun.

The dirt road winds up to Msinga Top, a high plateau with wide undulating views across the Tugela Valley. The locals call this place KwaXobanyawo, which means "to stomp your foot," because the indented plateau looks like a giant footprint.

Tiny boys herd their fathers' cattle, the cracking of their whips sounding like gunshots. They call out to their cows in clear piping voices that float in the sky like the pealing of church bells long after they've stopped ringing. Each cow has a name. Mapondebanoyi—"the horns of an airplane"—one is called, because its horns soar skyward. Another, Manzumfula, "river water," is so named because it is always first to drink at the river's edge. They stand among the fields of fluttering pink and yellow cosmos flowers, and the scene is almost alpine. On closer inspection the red earth winks through the threadbare pasture, and ugly jagged gullies scar the hills. Much of the land allocated to the Zulus during apartheid was marginal and is now badly overgrazed. Conservation extension efforts have largely foundered upon the Zulus' dependence on



Burning off a sugarcane plot, a field hand guards against flying sparks. The political situation in KwaZulu-Natal Province is less incendiary following elections in 1999, which resulted in a coalition government in which the ANC and Inkatha share power.



cattle and their voracious need for firewood to feed their cooking fires.

It is up here that I encounter Xolisile Khumalo. At 26 she has two children and a husband she sees only twice a year, at Easter and Christmas. The rest of the time he works as a driver in Egoli, the City of Gold, the Zulu name for Johannesburg, after the mines there. Xolisile's husband sends her 300 rand ($44) a month. It is a small amount to live on, even frugally, and she sews Zulu dresses to supplement their income. "The old culture when men were at home, like they should be, is gone now," she laments. "It is because of demand to earn money, to buy modern clothes and feed the family."

Bright and articulate as she is, Xolisile, like a quarter of adult Zulus, has never spent a day at school. "Our parents did not allow us," she says. "I was very upset, but I had no choice." However, she is sending her two children to the local school.

"What do you own?" I ask her.

"Apart from my old sewing machine?" She thinks for a moment. "Well, I had a radio once. But it broke."

Has her life changed at all since South Africa's white rule ended? "No, my life is exactly the same as before," she sighs. "Nothing is better."

What about other tribes in South Africa, what does she think about them? "Well, there are really no other tribes," she points out. "They are all Zulus really. They are just Zulus who were rejected, thrown out over





the years. Anyway, the Zulus are far more advanced than other tribes," she says, though she then admits that she has never met anyone from another black tribe.

THE HUGE TOWNSHIP of KwaMashu, just north of the port city of Durban, is the destination of many of Msinga's job hunters. Paul Nkabinde, a Zulu high school teacher, has agreed to be my guide around the township, which is home to a million people. He points out the house where political rivals attacked members of the Zulu royal family, hacking the king's niece to death. We pass several patrols of soldiers from 121 Battalion, a predominantly Zulu regiment of the South African Army deployed here in an attempt to damp the factional fighting between backers of the Inkatha Freedom Party and the ANC.

The migrant worker hostels are squat cinder-block barracks, four beds to a room. Most here in A section work on the railways. There are nearly 500 buildings, with an average of 32 men to a block, so 15,000 paying residents, with tens of thousands more in the shacks around the periphery, wives and kids, hookers and hangers-on. Almost all the Zulu men of Msinga spend most of their lives in these bulging barracks, hundreds of miles from their families. Unemployment in KwaZulu-Natal exceeds 40 percent, several points above the national rate, and the best hope of a job lies in the major cities.

Temba Mzobe is one of the fortunate ones. He has a job as a fork-lift driver, which pays him 1,600 rand ($234) a month. He has been in town since 1964. His family of nine, however, stays in rural Zululand. He sends half his salary there every month and visits about every three months.

"Our children are unruly because their fathers are absent," complains Temba. "We are not there to give discipline, especially to the sons. All the industrial places where the jobs are have been made in the big cities like Durban and Jo'burg, where we have to go now for work. We can't earn a living at home; there are no jobs, little land, bad rains."

The government has made some attempt to start up industries in rural Zululand, but with its poor infrastructure and distance from markets these schemes have not fared well.

"We Zulus," Temba says, "wear Western clothes because for a long

Scattered on land white farmers rejected, traditional Zulu homesteads dot ridges of the Drakensberg foothills (above). Each homestead centers around a kraal that holds the family cattle (above left). Poverty has forced more than half the men to seek jobs in towns and cities, leaving wives and children behind.



time you might be arrested for wearing traditional clothes, and you would never get a job dressed like that. Now we are nowhere—we are not in the West yet, but we have already left our own world behind. We can't reach the modern world, and we can't go back—we are nowhere."

Yet Zulu skills persist, and even here in the hostels, in the most unpromising of places, the culture has proved tenacious. Temba wears a traditional leather bracelet. "It is to talk to my ancestors," he explains. "I slaughter a goat and make this bracelet from its skin."

In a small space between the tenements, under the shade of a dusty thorn tree, to the accompaniment of the music of didgeridoos fashioned from long lengths of PVC pipe, other workers are practicing their traditional dances for an informal weekly competition. Their shoes are made of tire treads, their trousers sewn from fertilizer sacks. You'll find them here, every Sunday, between the uncleared rubbish dumps and the shanties, sweat streaming down their faces, dancing in the style of their ancestors before an audience of no one but themselves and the wide African sky.

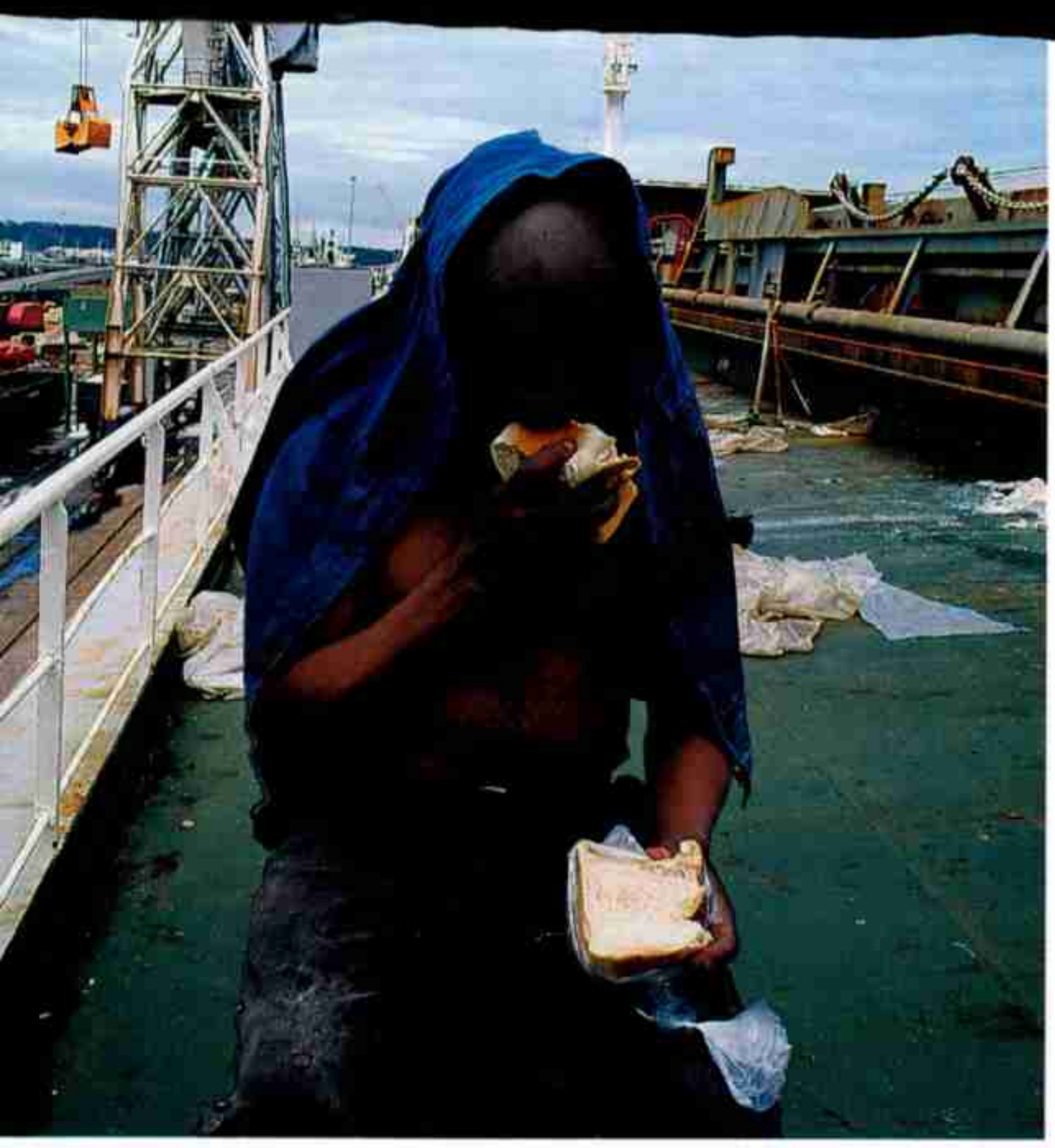
I leave the dancers and cross the township to Paul's house, which borders L section, KwaMashu's most dangerous neighborhood. "My house has been broken into, oh, more than ten times, by young boys, 12 or 13, armed with guns, some of them I teach," says Paul. "I have a gun too. What am I to do? Shoot them?"







Built during apartheid to house Durban's black labor force—such as this port worker (top right)—KwaMashu township is a hotbed of violence. Migrant workers live in barrack-like hostels, where they form tight-knit groups—like the men above practicing for a dance competition. Recruited by Inkatha and encouraged by police, hostel dwellers battled ANC gangs during the mid-1990s. Today political violence is less overt, but turf wars still claim victims (top left).



Paul introduces us to a group of youths hanging out by a shebeen, an improvised speakeasy. "Hijackers," whispers Paul. "I know some of them. I even taught several." A *dagga* (marijuana) pipe does the rounds, as do quart bottles of beer. The boys are well dressed in the fashion items of the moment, All Star basketball shoes, Ray-Ban sunglasses, cK jeans. After an inspection of my ID and a chat with Paul, they seem to accept that I am not in fact an undercover detective and openly admit their activities. "We take away from the white people because they have the money," says one. "We hijack cars; we have no other option, no job."

The rise in violent crime is one of South Africa's most pressing problems. A quarter of a million households were burgled in 1999 and more than 23,000 people murdered, giving it one of the highest murder rates in the world.

"I think now is a good time to leave," murmurs Paul, tugging at my sleeve. "Some of them are suggesting they rob us."

As such crime flares across KwaZulu-Natal, so the traditional respect for age and authority, which is the foundation of the Zulu hierarchy, has come under increasing pressure. At the Obhuka tribal courthouse, Chief Inkhanyiso Biyela (who is distantly related to Prince Biyela) does his best to hold the line. The people prostrate themselves at his feet as he arrives. They greet him as Wenamakulu—You, the Big One. He has been the chief here since 1966, from the tender age of 25. The chief has no formal training in law, having learned from the elders about Zulu law.

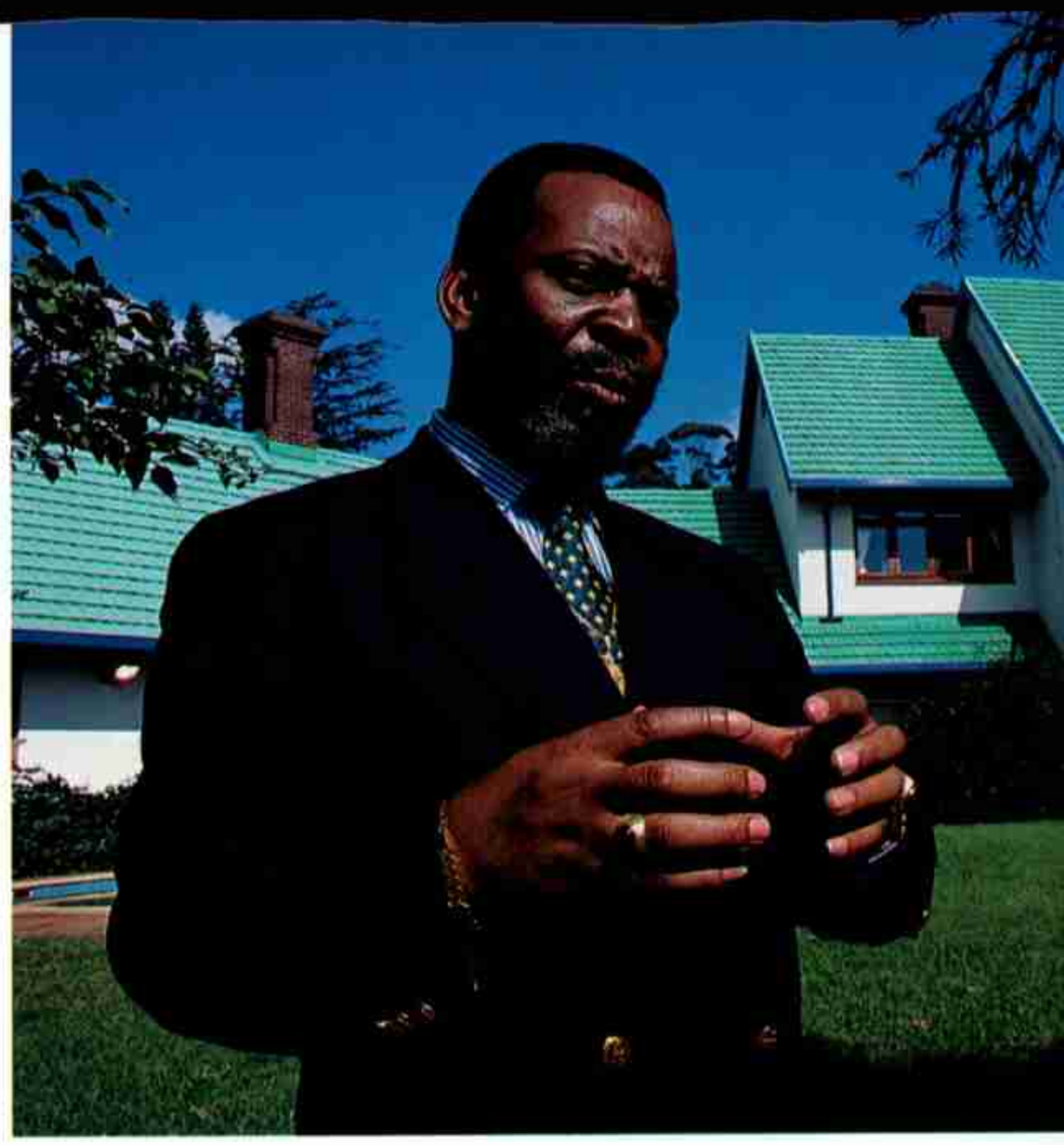
"WE TAKE AWAY FROM THE WHITE PEOPLE BECAUSE THEY HAVE THE MONEY," SAYS ONE. "WE HIJACK CARS; WE HAVE NO OTHER OPTION, NO JOB."

The courthouse, a simple brick building with windows void of glass, is packed with men and women seated on benches. The chief, who wears a double-breasted, pin-striped suit, enters through an anteroom, the corner of which is stacked with homemade weapons he has confiscated.

He takes his seat on a dais. Below him, on either side, sit his 29 *izinduna*—headmen. The court is called to order by a tribal policeman known as Gundane—the Rat—because of his rodent-like appearance. Gundane is unsure of his age but appears to be well over 65. He is attired in the most bizarre magpie regalia: skins and floral blouse, copper amulets, and a digital watch. His traditional black head ring has a lightbulb frontispiece, topped by a single black-and-white speckled guinea fowl feather and two pairs of duiker horns, and a long horse's tail that sways down his back. On his feet he wears tartan sneakers. A picture of King Shaka, who forged the Zulus into a nation 180 years ago, hangs around his neck in a plastic envelope, below a necklace made of pierced corks and toothpaste tube caps. Under Shaka's image is attached an empty plastic teddy bear bottle that once contained bubble bath. "It is the white man's child," he explains to me with a strangely menacing laugh. Also hanging from his body on leather thongs, I notice a spark plug, an

enamel mug, bullet cartridges, and a whistle.

The first case today is a man with a full white beard who was attacked and robbed. The accused, sitting opposite, is a youth just out of jail. "Why did you attack me in front of all the people?" demands the old man. "I am as old as your father. Don't you respect your elders?" It is the affront of the public beating that hurts more than the robbery. The argument sallies back and forth, and then the chief beats the palm of his hand on the tabletop and turns to the young man. "I am asking you about what is hidden underneath the rock—I want to lift the rock and reveal it. You are a young man, and you take the law into your own hands and attack a man who is your senior—even if his son had attacked you before. You have shown no respect for the Zulu way—you attacked him in public, spurning Zulu respect for age."



There follows an apology from the boy, coaxed out of him by his father, and an appeal to the victim by the boy's mother: "I can see that you are not a hard man and that you do this for our boy's own good."

The chief turns to the old man: "What would you like for your humiliation?" The complainant replies, "One goat, Chief. I must take the liquid from the spleen to wash away the hate and the impurities of this whole incident—but of course it is up to you, my Chief."

The chief puts the fine to the accused, and he agrees.

"I will fine you further, one cow," says the chief, "to use you as an example to the people under my command that if they disrespect their elders and take the law into their own hands, they will get a hefty fine—the cow to be brought here to me at court." There is a general murmur of agreement.

After leaving South Africa I got word that the old chief had died, leaving a younger successor to settle the disputes of everyday life. Zulu law has long coexisted with codified Western law and is effective in dealing with crimes like cattle theft, hut burning, minor assaults, and *ilobolo* (bride price) disputes. "More serious matters like murder and rape and firearms offenses," the chief had told me, "we send those to the police."

THE COMBINED FORCE of the police and the army, however, have difficulty controlling—and in fact have been implicated in—the political violence that has cursed KwaZulu-Natal for most of this decade, as what befell James Zulu, a revered Inkatha leader, shows. His death was bloody—just as his life was. One of the most powerful Inkatha "warlords" (warlords are political organizers with a body of armed men to enforce their authority), James Zulu was just 39 when he was murdered in April 1998 by an unknown assassin with a bullet to the back of the head.

At his funeral in southern KwaZulu-Natal, Mangosuthu Buthelezi, the Inkatha party's leader, took the podium. Silhouetted against the skyline

"I AM THE KING OF ALL THE ZULUS, THE GOOD AND THE BAD, ALL BELONG TO THE KING."







In rural KwaZulu-Natal a chief's word is law, as in this tribal court-room. During the apartheid era Inkatha ruled the Zulu homeland through traditional leaders. Now the ANC-led national government wants to introduce elected local leaders, a change opposed by the king (top left), whose break from Inkatha cost the lives of family members. Outside politics, Zulus turn to a different authority—consulting ancestors through diviners (top right).

were a thousand Inkatha Zulu warriors armed with cowhide shields and spears and short wooden clubs called knobkerries. Though Buthelezi serves as Home Affairs Minister in a coalition alongside the ANC, the supporters of these two parties remain deadly rivals on the ground. "The cycle of violence must end here," he pleaded, asking that the law be allowed to run its course. But even as he called for peace, the warriors were psyching themselves into battle mode. "We look to the barrel of the gun," went their war chants. Multicolored Inkatha flags fluttered in the stiff sea breeze as a warrior captain urged them on through a megaphone. He was wearing a miner's helmet painted black and white, like an Nguni cow, with two horns affixed to the top of it. Then the men started the profoundly unsettling *zee-zee-zee* war chant, and they bellowed "*uSuthu!*" the Zulu war cry.

As James Zulu's body slowly descended into the red earth, there were guns everywhere, pistols, revolvers, old rifles; dozens of shots pierced the air, and a haze of cordite hung over the grave.

After chasing Buthelezi from his parliamentary offices in Cape Town to his ministerial offices in Pretoria and to social functions among the moneyed Indian merchants of Durban, I finally ground him in the Zulu capital of Ulundi. The town is wedged in a valley between low hills, a dusty place with vast office buildings squatting on a hillside, as alien to the Zululand hills as a Martian spacecraft.

Buthelezi wears a houndstooth sports jacket, flannels, and brogues.



He is a curious amalgam of the two strands of Zulu identity, an educated Christian, while at the same time a traditional Zulu aristocrat. Christianized modern Zulus, the amaKholwa, were sometimes disparaged by the traditionalists as the amaRespectables, who traded in their dignity to mimic the white man. The amaKholwa in turn despised the rural traditionalists as uneducated skin-wearers. But now Buthelezi sees these two wings of Zulu culture converging again.

Buthelezi's power flows through his leadership of the provincial House of Traditional Leaders, made up of 300 Zulu chiefs. But he has become ensnared in a rivalry with the Zulu king, Goodwill Zwelithini, who is also his nephew. Buthelezi believes that the king was recruited by Nelson Mandela and the ANC in an effort to seduce tradition-minded Zulus away from Buthelezi's Inkatha party.

At a baptism near Durban a woman takes seawater and sand home for use as traditional medicine. A tide of change has swept South Africa since Europeans first came ashore more than 300 years ago. Now the Zulus live in opposing worlds: African and Western, animist and Christian, traditional and modern.



WHEN I PUT THIS TO KING GOODWILL ZWELITHINI, he looks pained. "The king has never belonged to any political party. They must not try to pull me into politics for their own selfish reasons. I will never let them make use of me. I am the king of all the Zulus, the good and the bad, all belong to the king. He must accept them as his children. And I am king, too, of those who are dying because of party politics."

I meet the king at Linduzulu, one of his seven palaces. Some are traditional Zulu palaces, thatched and mud walled, but this one is a large modern house with a bright green tiled roof, set in extensive grounds with a wide view out over the rolling hills of northern Zululand. I am ushered in the front door over a large lion skin rug, the beast's jaws frozen open in a silent roar. "A present to the king from some of my subjects in southern Natal," indicates His Majesty.

He is a small dapper man, rigged out today in Western gear: black blazer, slacks, tie, and striped shirt. Around his neck is a heavy gold chain, but whatever hangs at the end of it is hidden underneath his jacket. A fob watch perhaps, or a royal crest? Later, as the room heats up and he unbuttons, it is revealed to be a large gold crucifix. The king, notwithstanding his five wives, is a devout Anglican.

His most pressing preoccupation is with AIDS, which is cutting a particularly lethal swath through the Zulu population. In spite of health education programs, which have even tried to recruit *iziyanga*—traditional healers—to the cause of AIDS prevention, HIV now infects more than 20 percent of the Zulus in KwaZulu-Natal Province.

"In 1984 AIDS was a new thing to us here," the king says. "So I asked myself what we could do in our culture to fight this thing, and I decided to restart the maidens' traditional virginity testing here at the royal household with my own daughters and female relatives." As a mere visual inspection, the test is less a reliable indicator of virginity than a deterrent through peer pressure.

Despite the AIDS situation the king remains optimistic about the survival of Zulu culture. He is trying to draw together the Zulu diaspora, the waves of refugees who fled King Shaka's violent nation-building efforts during the tumultuous period known as the *mfecane*. Chief Mpezeni from Zambia has visited, and King Zwelithini sent his sister to Malawi to visit the Zulus living there. "I was invited to visit by the Mozambique president, and when I got there, I was received as king of the Zulus, as their father, because they too are a Zulu offshoot. The

Ndebele people from southern Zimbabwe visited me there, and they said they were coming to see their elder brother. They all accept the Royal House now. So why have they all come back into the fold with the eighth king? Why? It's simple. If you have a problem, you go to your father."

Finally, I ask him what it is about the Zulu people that has ensured them a place in the imagination of people everywhere.

"Why are we well-known in the world? Because we have defeated the great British forces in 1879—they conquered the world, and we stopped them here."

AS I LEAVE KWAZULU-NATAL, the plane banks steeply away from Durban. I look down at squatter camps that surround the city, but they are already camouflaged by the thick tropical vegetation that covers the east coast. We gain altitude, and soon we are over the hilly rural heartland once more. I look north to the Mfule River, home of the ancient Prince Galenja Biyela, who told the story of Isandlwana. And I smile to recall my leave-taking from Simunye lodge. I had crossed the river to climb out of the Mfule Valley and encountered a man sitting by the path, deftly weaving a small object from palm leaves. We greeted, and he introduced himself as Ambulance Malinga.



Ambulance? He told me he was born just after the first ambulances were introduced into Zululand, and his pregnant mother was taken to the hospital in one. So he was named in its honor.

I inquired of his handiwork. He was making an *umncedo,* he said. This is a palm leaf plaited into a small hollow gourd, which King Shaka decreed that all his warriors must wear over the heads of their penises to prevent them from getting erections and being distracted from making war by thoughts of making love. The Zulu have a nickname for it. They call it *indluyo-hlanya,* the madman's hut.

"But surely no one wears it today?" I asked. Ambulance grinned and lifted his loincloth just long enough for me to see that he was indeed traditionally attired. I had to ask one last question. How was it fitted?

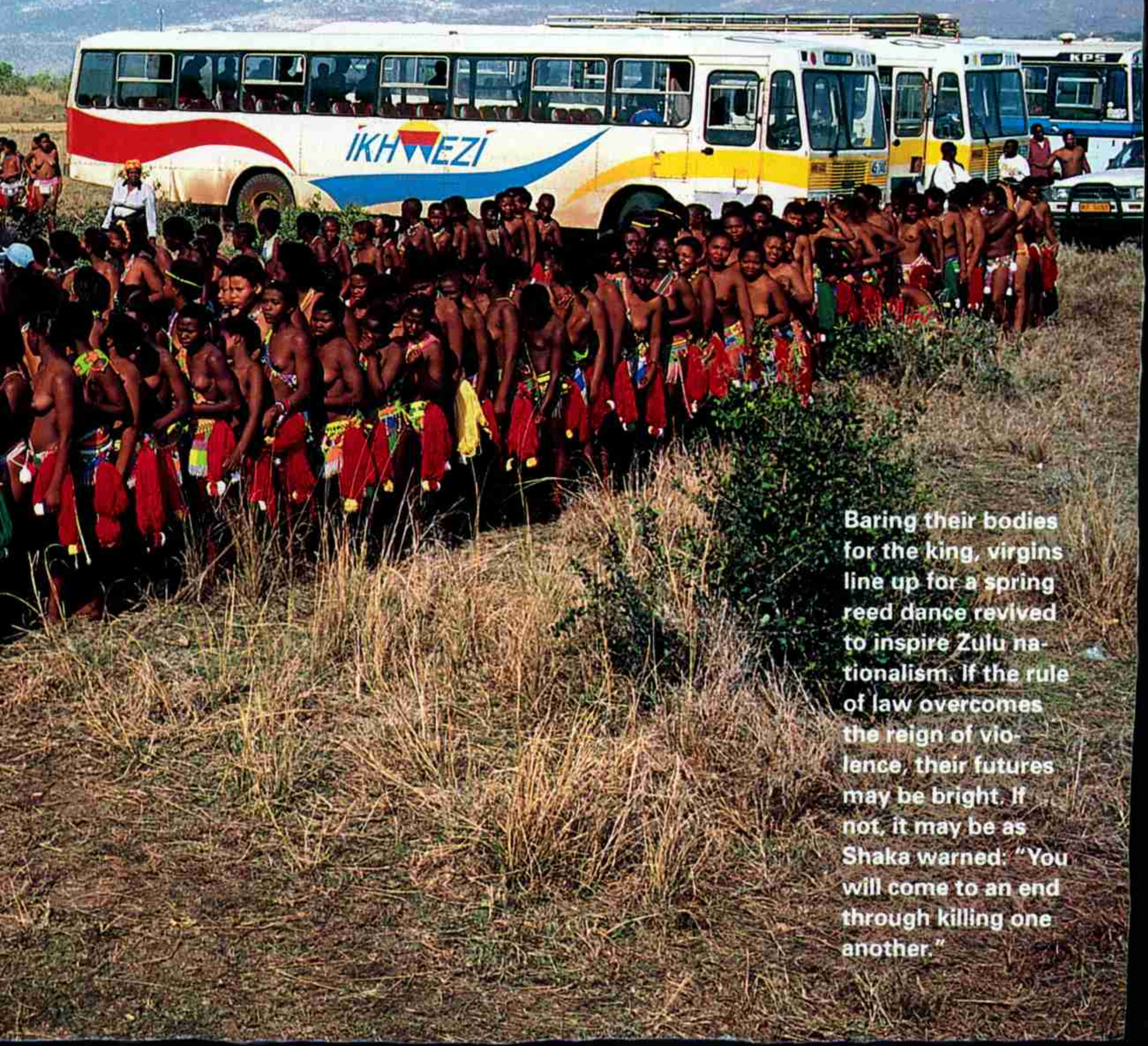
"Aha," laughed Ambulance. "Simple. You measure the size of a man's thumb, and make the entrance to that size."

He invited me to the beer hut for breakfast, and on my departure he thrust a little package into my hand. "It is a present," he said. "Open it."

Inside I found my own personal madman's hut.

"We made it specially for you," he said.

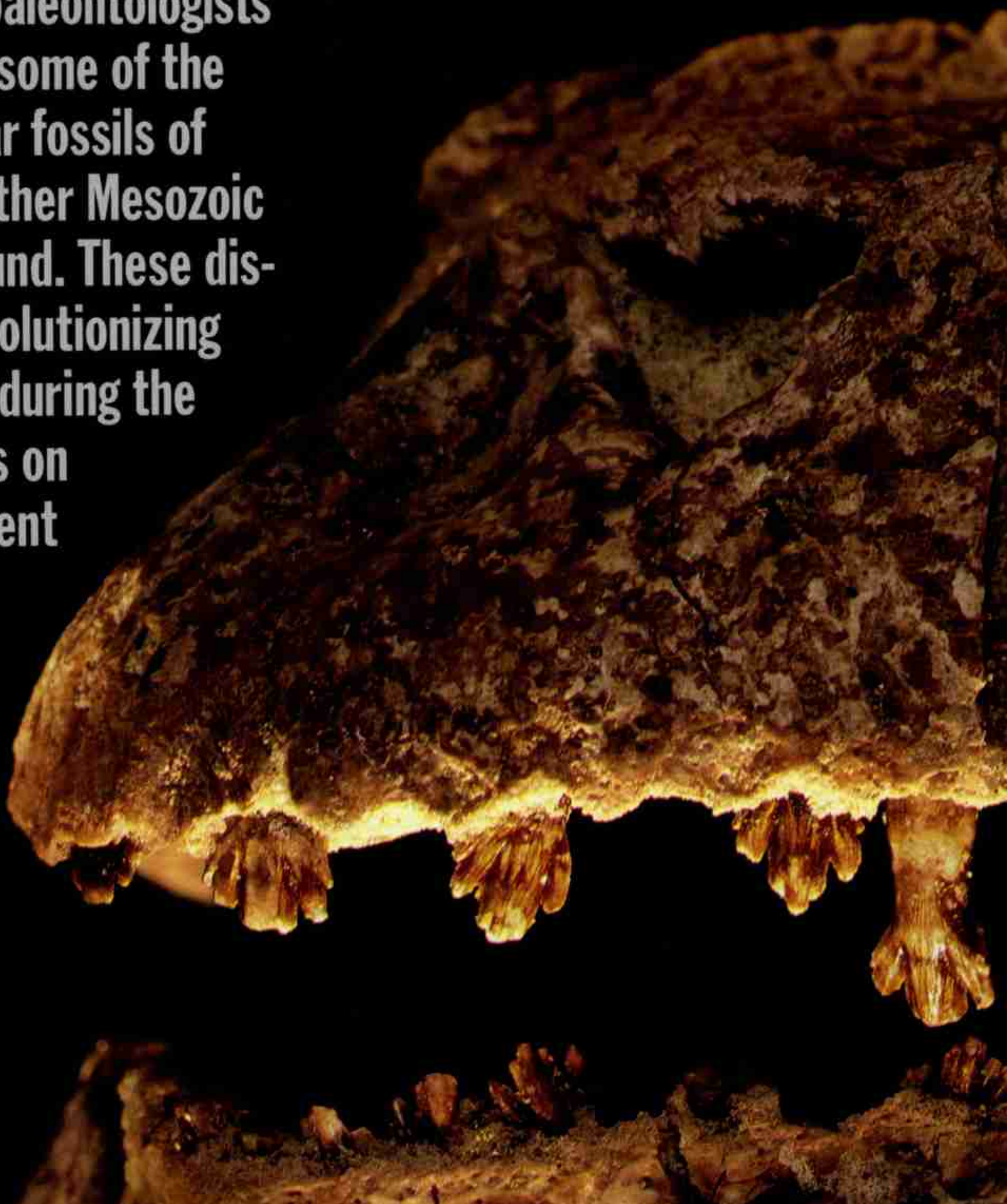
As I left, I could hear him guffawing back in the beer hut. I examined my madman's hut. It had a tiny entrance, the size of my little finger. □



Baring their bodies for the king, virgins line up for a spring reed dance revived to inspire Zulu nationalism. If the rule of law overcomes the reign of violence, their futures may be bright. If not, it may be as Shaka warned: "You will come to an end through killing one another."

Monsters of

In Madagascar paleontologists have unearthed some of the most spectacular fossils of dinosaurs and other Mesozoic animals ever found. These discoveries are revolutionizing ideas about life during the age of dinosaurs on the supercontinent of Gondwana.



Madagascar

Photographs by MARIA STENZEL
and MARK THIESSEN
NATIONAL GEOGRAPHIC PHOTOGRAPHER

Art by MARK HALLETT

The jack-o'-lantern grin of a 70-million-year-old crocodile fossil is enhanced by nostrils that resemble eyes. With its short snout and clove-shaped teeth, it was probably a herbivore.



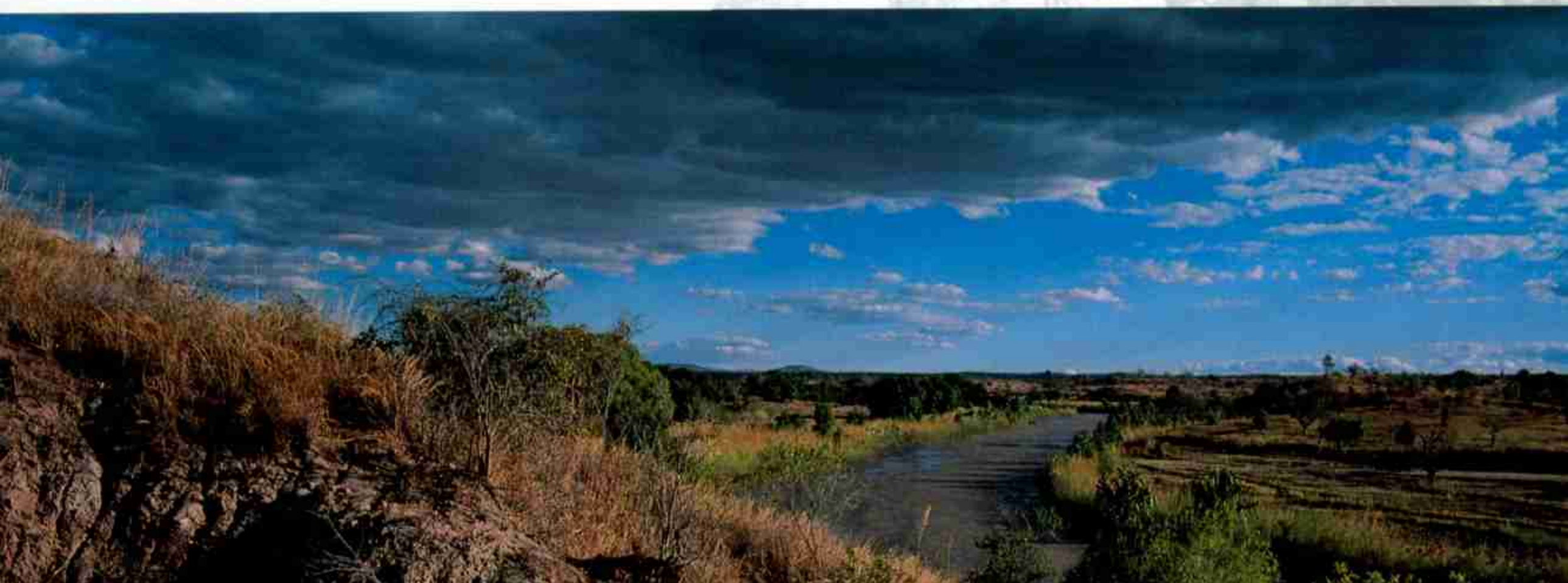
Digging Into the Past

BY JOHN FLYNN

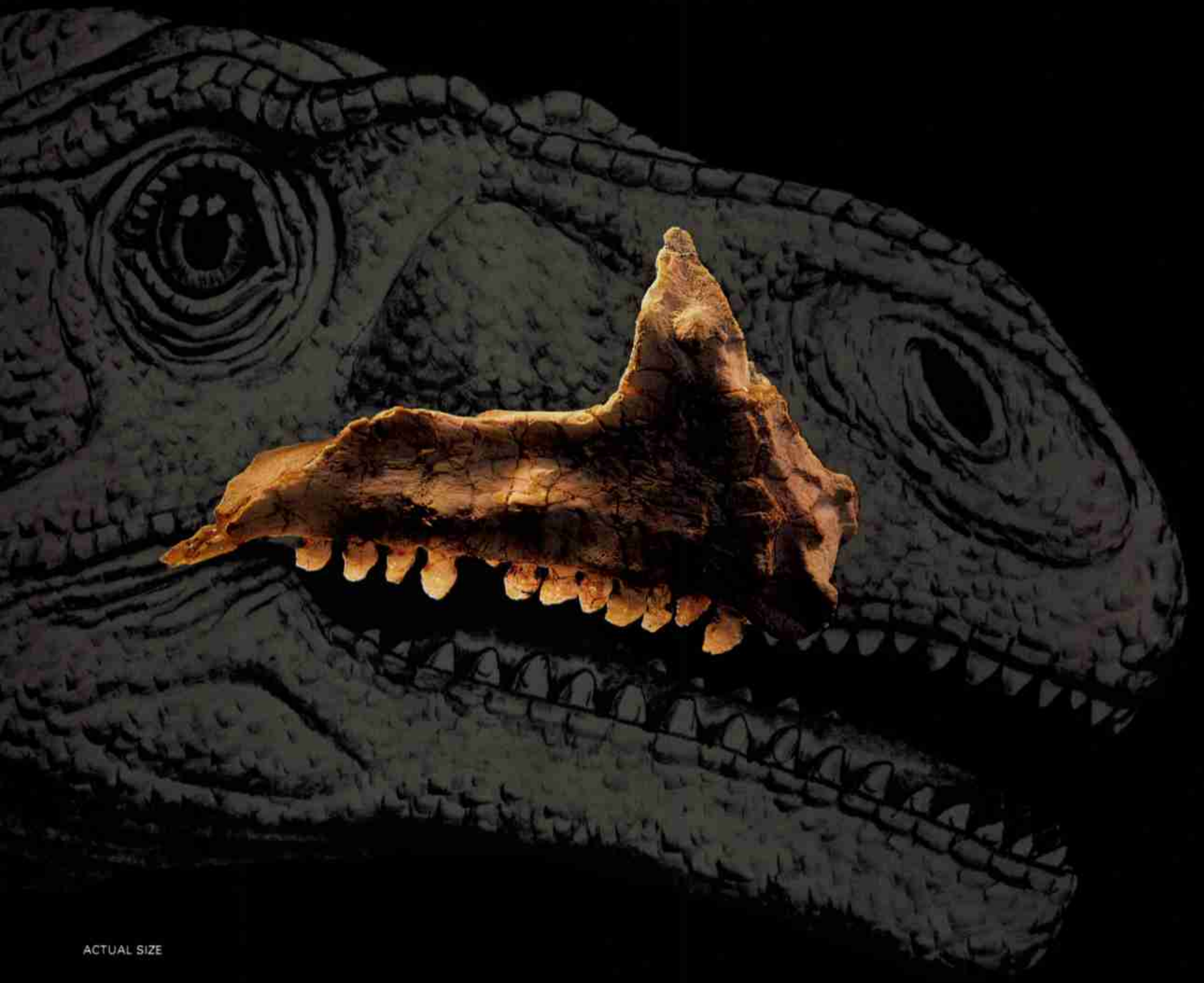
I was drawn to Madagascar by my fascination with the peculiar life-forms on this giant island nation: lemurs, chameleons, baobab trees, and other organisms that evolved in isolation over millions of years. My research team and I arrived in 1996 not knowing how far back in time our discoveries would take us—perhaps back to the roots of the island's astonishing biodiversity. For four years our team of experts from the United States and Madagascar has dug into the "red island's" ocher soil, uncovering white bones from a time some 230 million years ago when dinosaurs and mammals were first appearing on the evolutionary stage. These new specimens shed light on the transition from mammal-like reptiles to true mammals, a process that spanned tens of millions of years. Our discoveries help fill out the fossil record of land vertebrates from the Triassic, earliest of the three Mesozoic periods: Triassic, Jurassic, and Cretaceous.

RESEARCH PROJECT

Supported in part by your Society



MARIA STENZEL



ACTUAL SIZE

Oldest Dinosaur Ever Discovered?

Like a ghost from a misty past, a newly discovered species looms behind the jawbone fossil that inspired its likeness. The bone is about 230 million years old, making this unnamed dinosaur perhaps the oldest ever found. A prosauropod, it predates the long-necked sauropods, the largest known dinosaurs. At a dig site in southern Madagascar (left) we probe layers of reddish brown silt and clay and hit pay dirt: a thin stratum so loaded with fossilized bone that we must peel away the material inch by inch. The rock is riddled with microscopic fractures and can turn to dust as it dries, so we sometimes saturate the fossils and encasing rock with a stabilizing glue. When cleaned in our labs at the Field Museum in Chicago, the fossils are creamy white, looking hauntingly similar to bones from modern-day animal carcasses. This fossil and others promise significant new knowledge of the middle to late Triassic, an interval poorly understood because few paleontological sites anywhere in the world hold fossils from that time.

Risen from its grave in pixel form, the skull of a newly found species sits in front of the tree-shaded hill where it was discovered by a Malagasy student, Léon Razafimanantsoa. The upper teeth and eye sockets (facing page) are strikingly well preserved, a rarity since skull bones are very fragile. The animal was a cynodont, meaning "dog-toothed," a seminal group that includes modern mammals. The group originated 250 million years ago in the late Permian period.

This and other Madagascar finds resemble cynodonts from South America, suggesting that these animals were widespread 230 million years ago, before the breakup of a landmass that included both that continent and Madagascar.

Such early cynodonts spanned the transition from large, cold-blooded creatures with sprawling limbs to smaller, warm-blooded mammals. They displayed rudimentary features of mammals, such as

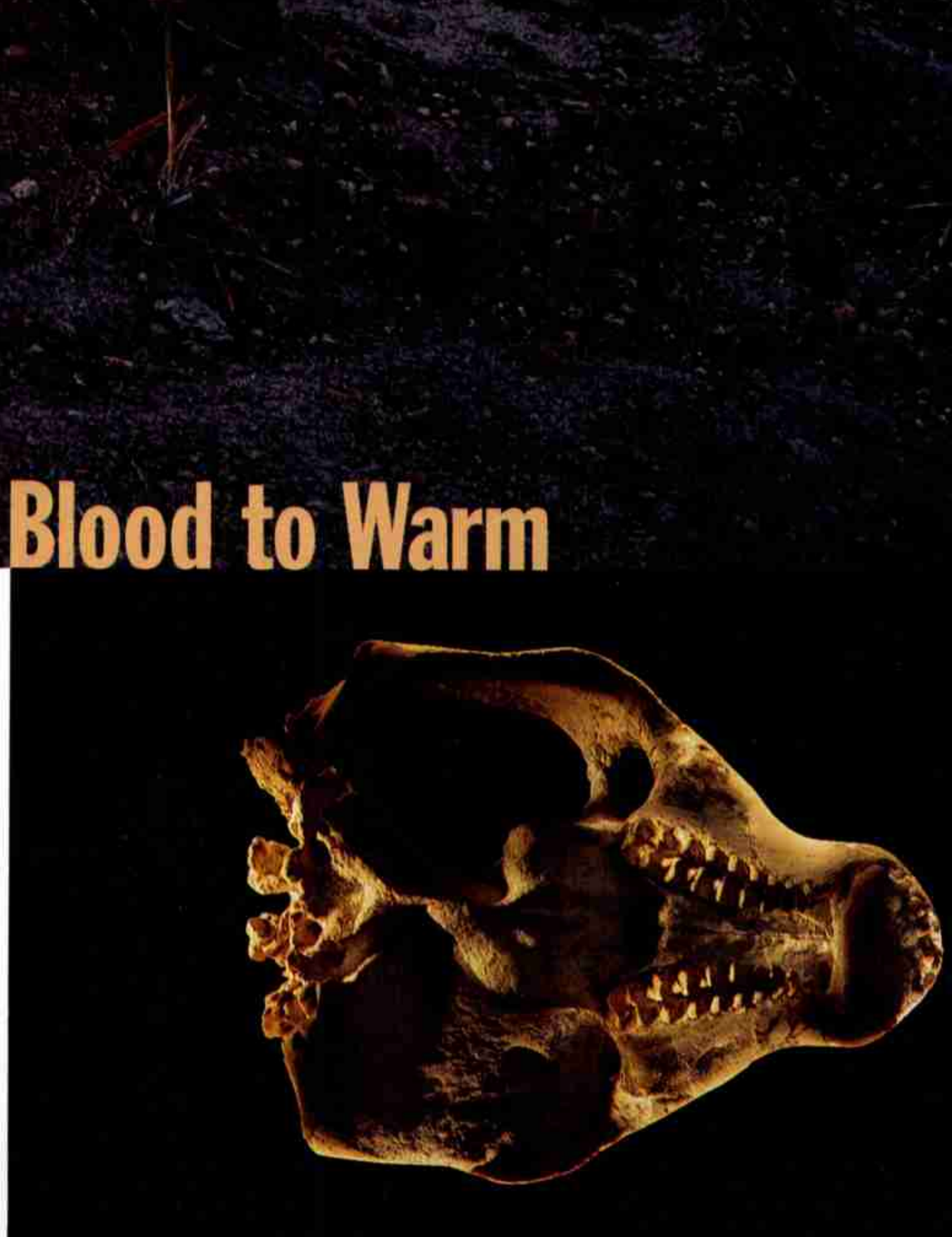


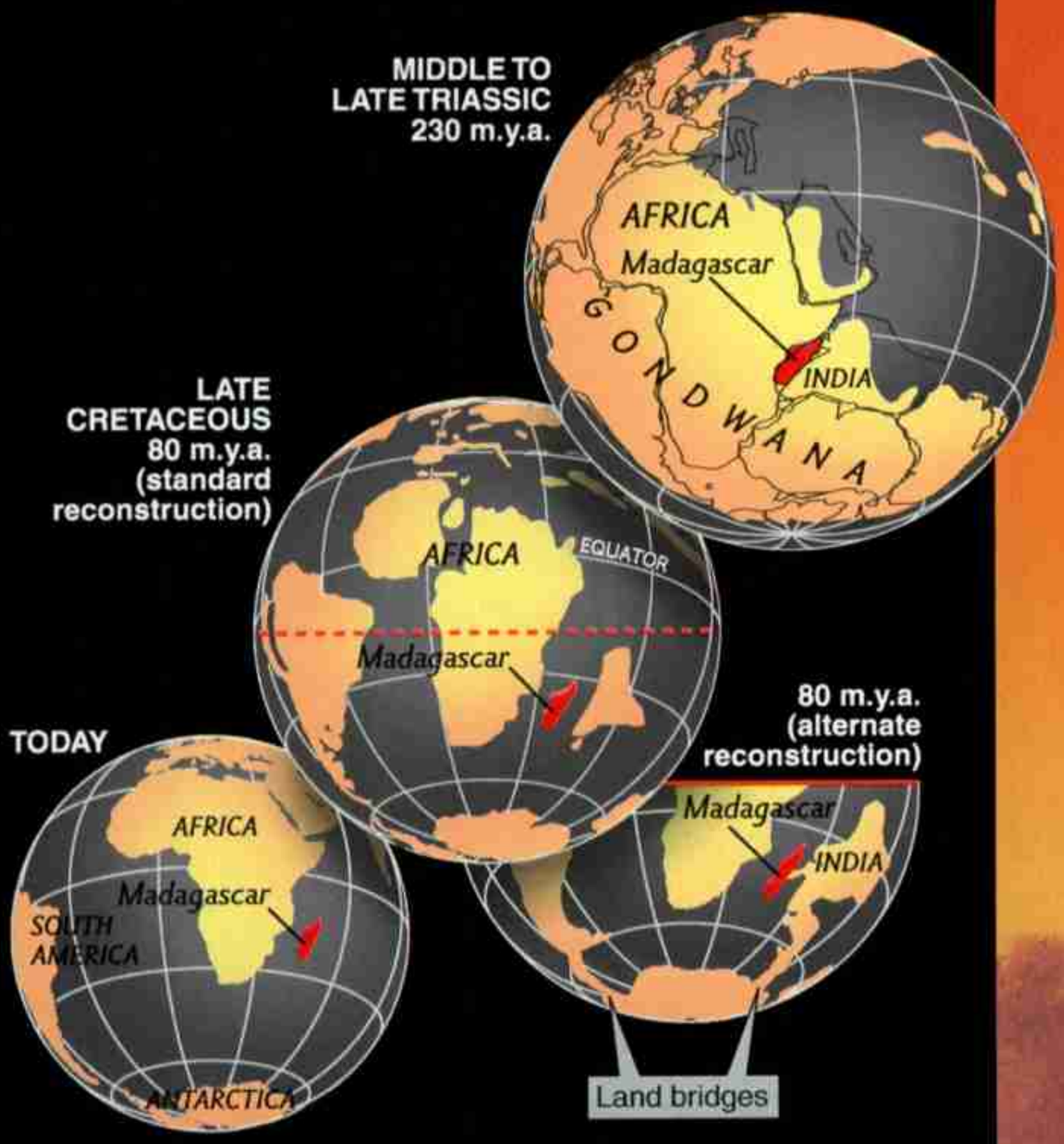
MARIA STENZEL (ABOVE)

From Cold Blood to Warm

fewer bones in the lower jaw, and they may have had hair as insulation to maintain higher body temperatures.

MARIA STENZEL photographed Tibetan New Year celebrations for the January 2000 NATIONAL GEOGRAPHIC, and MARK HALLETT painted scenes for "Africa's Dinosaur Castaways" in the June 1996 issue. JOHN FLYNN is head of the geology department at the Field Museum in Chicago.





An Island Ark



Slow but mighty forces of plate tectonics birthed Madagascar out of Gondwana, the supercontinent ancestor of South America, Africa, Australia, India, and Antarctica. During the Triassic 230 million years ago (m.y.a.) the future island nestled between Africa and India. Parting from eastern Africa, Madagascar headed southeast, its relationship to other wandering landmasses shifting in ways that are still unclear to paleogeographers. Reconstructions usually show an isolated Madagascar by 80 m.y.a., but new fossil finds suggest that it and India may have been connected to Antarctica, and thus to South America, at that time. The Cretaceous scene at right portrays a herd of long-necked titanosaurids arriving at a river where crocodiles rise up in a feeding frenzy, and flesh-eating birds called *Rahonavis* (page 54) swoop in to scavenge their share.

SOURCES: STANDARD RECONSTRUCTIONS BY CHRISTOPHER R. SCOTESE OF THE PALEOMAP PROJECT; ALTERNATE RECONSTRUCTION BY CHRISTOPHER N. WOLD, WILLIAM W. HAY, AND ADRIENNE ROSSBY WOLD OF BALANCED PALEOGEOLOGY

NATIONAL GEOGRAPHIC MAPS



A Fossil Bonanza

BY DAVID KRAUSE

RESEARCH PROJECT

Supported in part by your Society

My team had more hope than clues in 1993 when I led an expedition to northwestern Madagascar with scientists from five U.S. institutions and Madagascar's University of Antananarivo. We went in search of late Cretaceous dinosaurs and other animals, but all we had were sketchy accounts of fragmentary bones and teeth, first noted by a French infantryman participating in an 1895 invasion. I was dazzled by the 70-million-year-old fossil treasures we raised from the dry grassy hills. Four expeditions later I'm still amazed at our good fortune.



Long in the Tooth

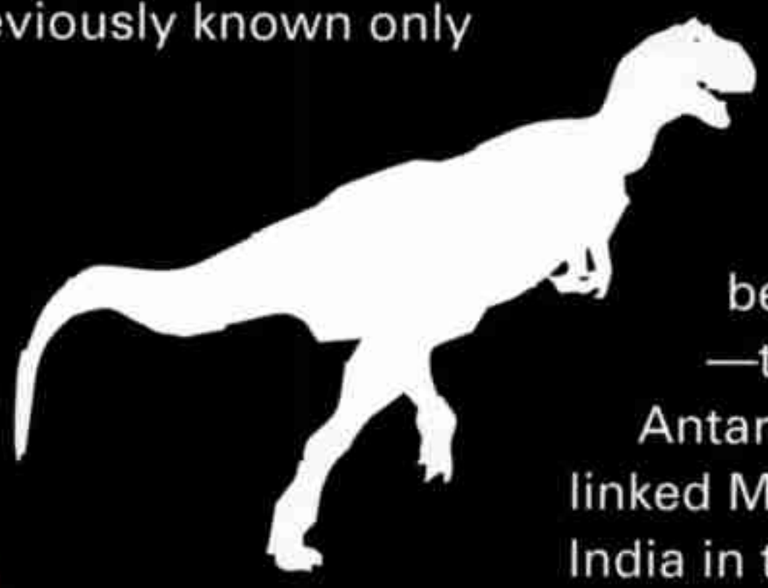
Face-to-face with a savage hunter, Scott Sampson of the University of Utah (above, at center) and Patrick O'Connor, at left, and Matthew Carrano of the State University of New York (SUNY) at Stony Brook excavate a meat-eating theropod called *Majungatholus.* It was déjà vu for Sampson. In 1996, while unearthing a sauropod nearby, he encountered a row of teeth that clearly didn't belong to the huge herbivore. They were dagger-shaped and serrated rather than straight and peglike. The fossil proved to be the exquisitely preserved upper jaw of *Majungatholus,* a genus previously known only from a few bones and teeth.

Over the following days many additional delicate pieces were revealed. Now, almost all its bones reunited, the specimen includes one of the most complete dinosaur skulls (cast shown at left) in existence.

The 30-foot-long animal looked much like predatory dinosaurs that lived about the same time in what is now Argentina and India. The similarities suggest to me that the island had not been isolated for long—that land bridges to Antarctica had recently linked Madagascar and India in the east with South America in the west.

DAVID KRAUSE teaches anatomy and paleontology at the Stony Brook campus of SUNY.





MARIA STENZEL (TOP)

Designed to Kill

A gracefully lethal claw on the second toe of a raven-size bird fossil is the weapon of a predator. Catherine Forster, my colleague at SUNY-Stony Brook, named the animal *Rahonavis,* combining Latin and Malagasy words to connote a menacing bird from the clouds. *Rahonavis* lived about 70 million years ago.

The skeletal structure of the foot and claw is strikingly similar to that of the predatory dinosaur *Velociraptor,* providing new evidence of the dinosaurian origin of birds.

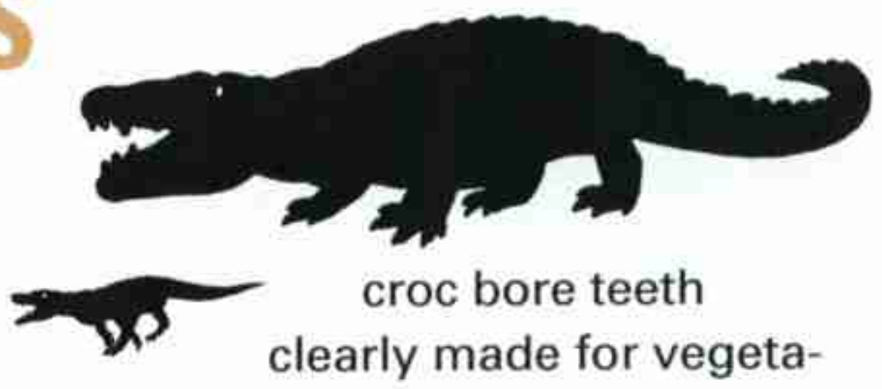


MARIA STENZEL (BELOW)

A Diverse Clan of Crocs

Small crocodiles and their bigger cousins haunted the land and waterways of Madagascar throughout the late Cretaceous. So far, seven kinds have been unearthed, ranging in size from the two-foot-long *Araripesuchus* to *Mahajangasuchus,* which measured 13 feet (both on facing page).

Carrying precious cargo, my colleagues and I (right, at left) lug a specimen encased in plaster for shipment to the Field Museum. There our crocodile specialist, Gregory Buckley of Chicago's Roosevelt University, removed the plaster casing and the sandstone matrix surrounding the bones. Before him lay the most bizarre crocodile he had ever seen (pages 44-5 and 56-7). It lacked the typical crocodilian long snout and conical teeth. Instead, this pug-nosed croc bore teeth clearly made for vegetation, not flesh, and a snout that looked as if it had run headlong into a tree.







Epic Migrations



Plates of armor called scutes protected the back of the pug-nosed crocodile (above). Neither it nor any other crocodile species we found is a plausible ancestor of the young Nile crocodile I hold at left. The only species that lives on Madagascar today, the Nile crocodile almost surely made its way from Africa, more than 250

MARIA STENZEL (LEFT)



miles away, after Madagascar became an island in the late Cretaceous. I believe it either swam or rafted on huge mats of vegetation that were washed out to sea and blown across the Mozambique Channel by massive cyclones.

More than 85 percent of the terrestrial and freshwater vertebrate species now living on Madagascar are unique to the island, including the lemurs, the most well-known of Malagasy animals.

Yet paleontologists have had no more luck with these animals than with the Nile crocodile; we have uncovered no late Cretaceous species that could be ancestors of Madagascar's modern vertebrates. Those precursors probably arrived after the Cretaceous fauna died out. How they came, when, and from where—these are the questions that draw me back to this fascinating island. □

For more about dinosaurs online see *www.nationalgeographic.com/dinorama*.

FU

ARTICLE AND PHOTOGRAPHS BY DARLYNE A. MURAWSKI

NGI

They are nature's little-known laborers, both creators and destroyers, relentlessly nurturing life, or crippling it, or snuffing it out. One fungus ferments grapes into wine. Another kills them on the vine. Fungi make bread rise and tempt gourmets. They blacken bathroom tiles as mildew, cause and cure diseases, enrich soil, rot wood, and jump-start the workings of plant roots. These mushrooms, prized by connoisseurs, will propagate by gently launching spores from their gills, one of the intriguing ways that fungi reproduce as they insinuate themselves into every corner of life.

Lactarius hygrophoroides, up to 4 inches across

PLANTS OR ANIMALS? Fungi are neither, making up their own kingdom. They range in size from the microscopic to a species that is known to spread over 30 acres. Fungi lean toward an animal lifestyle in that they consume other organisms for nutrition, since, unlike plants, they can't produce their own food. Yet, like some plants, certain fungi cast their fate to the wind, sending forth spores to drift where they will, something that allergy sufferers feel all too keenly.

The energetic way one variety broadcasts its spores inspired the name of its genus, *Pilobolus* (right), which means "hat thrower." After landing on leaves and grass, its spores



are ingested by a deer, horse, or other herbivore, pass through the intestines, then germinate in the animal's dung. Humans too are unwitting hosts to fungi, which cause athlete's foot, jock itch, and yeast infections. Fungus experts, called mycologists, estimate that the Earth may harbor as many as 1.5 million fungus species, but only a fraction have been described.

A sunburst design emerged as a gilled mushroom dropped its spores onto paper. Dew clings to a shotgun fungus growing on rabbit dung. When mature, dark button-like spore cases shoot six feet or more.

Pilobolus crystallinus, about 0.3 in tall

Phanerochaete chrysorhiza, each tooth about .06 in

HUGE AND DIVERSE, the fungus kingdom holds many remarkable sights but is largely unexplored. A walk in the woods reveals fungus fruiting bodies, called mushrooms, sprouting from soil and tree trunks. Some species hold the promise of "biopulping": They can decompose wood chips without the use of toxic chemicals. Diligent searchers might come across the lilliputian world of *Crucibulum* (below), which produces spore cases resembling eggs in baskets that



***Crucibulum laeve,* each basket .25 in across**

measure a quarter of an inch across and look as if they are ready for gathering.

Most fungi are unseen varieties living in soil. There in their microscopic workshops they play a crucial role—using enzymes to break down organic compounds into nutrients for themselves, and inadvertently for plants and trees.

A vividly colored fungus (left) is a thorough recycler, helping to crumble a forest log into compost. White-egg bird's nest fungi cradle tiny spore packets that scatter when splashed by raindrops.

Scarlet profusion proclaims a reproductive phase of the British soldier lichen—marriage of a fungus and a green alga. It's a partnership, but the alga does the heavy lifting. Composing only a small percentage of the lichen's mass, the alga makes carbohydrates and provides them to the fungus.

British soldier lichen, *Cladonia cristatella*, about 0.6 in tall (left); *C. pleurota*

SHAMELESS EXPLOITERS, members of the huge category of parasitic fungi infest other life-forms. Each year agricultural pests such as smuts and plant rusts do untold millions of dollars in damage to crops worldwide. One species has the unappetizing name corn smut (below), yet it is a delicacy in Mexico and is gaining popularity in the United States marketed as "Mexican truffles."

Trichaptum (below right) and other mushrooms that rot wood are sometimes hosts themselves for smaller species such as various ascomycetes, a group of fungi that includes truffles, yeasts, morels, and some molds.



Ustilago maydis, **up to 5 in across**

Curiously, some rusts require more than one host plant to live out their life cycle. In temperate climes *Puccinia sparganioides* spends winter on cordgrass. Come spring, it produces small, delicate spores that are blown to nearby ash trees where they germinate on new leaves (above right). Their spores then infect the cordgrass, completing the cycle.

Fungal pests can cause social turmoil. Some scholars suspect that the physical symptoms and erratic behavior that led to the Salem witch trials were caused by a toxic fungus consumed with cereal grains, especially rye. In the mid-1800s a fungus turned Ireland's potato crops into black gooey masses. About one million people died, and more than a million emigrated to North America and other lands.





Piggyback riders: Bulbous growths of smut commandeer an ear of corn (above left). Rust envelops the base of a green ash leaf (top right). Tiny mushrooms stick out like straight pins from a host mushroom stained by algae.

Puccinia sparganioides, about 1 in across

Phaeocalicium polyporaeum, about .07 in tall, on *Trichaptum biforme*

***Arthrobotrys* sp., magnified about 200 times**

SILENT STALKERS: Neither tooth nor claw arms the predatory fungi. They vanquish and consume through molecular stealth. For a doomed ant (below) the end begins when a *Cordyceps* spore lands on its exoskeleton. The spore finds purchase between skeletal plates, germinates, and grows, feeding off the dying ant's body. The traps of *Arthrobotrys* (left) are its hyphae, or filaments, that snare nematode worms as they wander through the soil.

Yet fungus and animal species can work in concert. Some fungi release spores after they are carried to the surface by termites. Leaf-cutter ants cultivate fungi as a food source. The female southern pine beetle carries a fungus in protected pouches and distributes it as she tunnels beneath tree bark. The fungus then becomes food that the beetle larvae need to survive.



Cordyceps myrmecophila, **about 0.5 in tall**

Fungi and plants form mutually beneficial partnerships too. Most plants are aided by fungi that supply minerals necessary for their growth and assist in water absorption. Fungi also provide us with valuable medicines such as penicillin as well as delectable cuisine. From harmless decomposers to insidious predators and pathogens, fungi fill many roles. And with so many species undescribed, there should be plenty of opportunity for scientific investigation to reveal more stars in the fungus among us.

It's all over for nematode worms trapped and soon to be digested by the looped filaments of *Arthrobotrys* (left). The fruiting body of *Cordyceps* rises from a dead ant that the fungus infected as a spore and then consumed.

Panellus stypticus, each cap about 0.8 in across

Eerie glow of bioluminescent mushrooms dapples a tree trunk like an alien armada. Mushroom enthusiasts use wood infested with such species to mark paths or even as bedroom night-lights. Intentional or not, humans and fungi are partners from cradle to grave. □



Biologist DARLYNE A. MURAWSKI has photographed butterflies, moths, and parasites for the GEOGRAPHIC and is working on an article on spiderwebs for the magazine.

Missing for 304 years

THE FAILED BATTLE OF OCTOBER 1690

FRENCH vs. ENGLISH

AT QUEBEC

THE RIVALS:

Comte de Frontenac *and* Sir *WILLIAM* PHIPS



THE *Discovery*

Phips's ship is found at Baie-Trinité

with muskets, silver, and other historical

TREASURE

By R. James Ringer • Photographs by Bill Curtsinger

THE Finds

A musket personalized with shell beads, or wampum, is a major discovery from the 1690 wreck. The musket may have belonged to a Native American member of the Massachusetts militia hoping to drive the French from North America.

BASED ON A PLAYBILL FROM THE MASSACHUSETTS HISTORICAL SOCIETY (OPPOSITE); PETER WADDELL, PARKS CANADA UNDERWATER ARCHAEOLOGICAL SERVICES

Trolling humiliation and defeat behind them on the frigid St. Lawrence River, the retreating detachment of 2,300 New Englanders wanted nothing more than to sail back home, crawl into their warm beds in Massachusetts, and put their disastrous invasion of Canada behind them.

Smallpox and fatigue had weakened them. Food supplies were dwindling. Then their situation worsened. The fleet of some 30 vessels—attempting to navigate the river without an experienced pilot—began to run aground.

Four ships were lost. By the time the retreating flotilla floundered into Boston, some 400 men had died.

The abortive 1690 attack on Quebec City became the most significant of a series of skirmishes known as King William's War, primarily a European grudge match between the Protestant English monarch and France's Catholic ruler, Louis XIV. Sir William Phips, knighted after his successful salvaging of a Spanish galleon, commanded the English invasion. Except for Phips, the names of the ill-fated participants were largely lost to history.

Then, on Christmas Eve, 1994, Marc Tremblay noticed some peculiar submerged items half-buried in the sand near his cottage at Baie-Trinité on the St. Lawrence River. An unusually strong storm had swept away the top layer of sediment to reveal a scattering of muskets, bottles, axes, and shoe fragments. Tremblay, who happens to be a wreck diver, also recognized several lengths of timber—clearly the remains of a wooden ship.

Marc-André Bernier, an underwater archaeologist with Parks Canada, rushed to the remote site by snowmobile and with the

THE Key

Three initials—IMS—seen on the dolphin-decorated handle of a porringer, helped identify the wreck as one from the English fleet commanded by William Phips. "I" and "S" stand for the first names of a married couple. "M" is for their last name. Records reveal one such militiaman aboard the ship: Sgt. Increase Modsley. He and many fellow soldiers never returned from fighting Frontenac's troops (map).

Pointe de Levy

bois

bois

50

51

52

53

Anglois.

DE

LAURENS,

bon Moüillage
à 17. brasses.

Cap aux diamants.

Chemin.

QUÉBEC,

45.

le Comte d'Estrées de la Riviere

de S. Jean

Sr. de S. Jean

Nombre de 3000 hommes,

petite Riv.

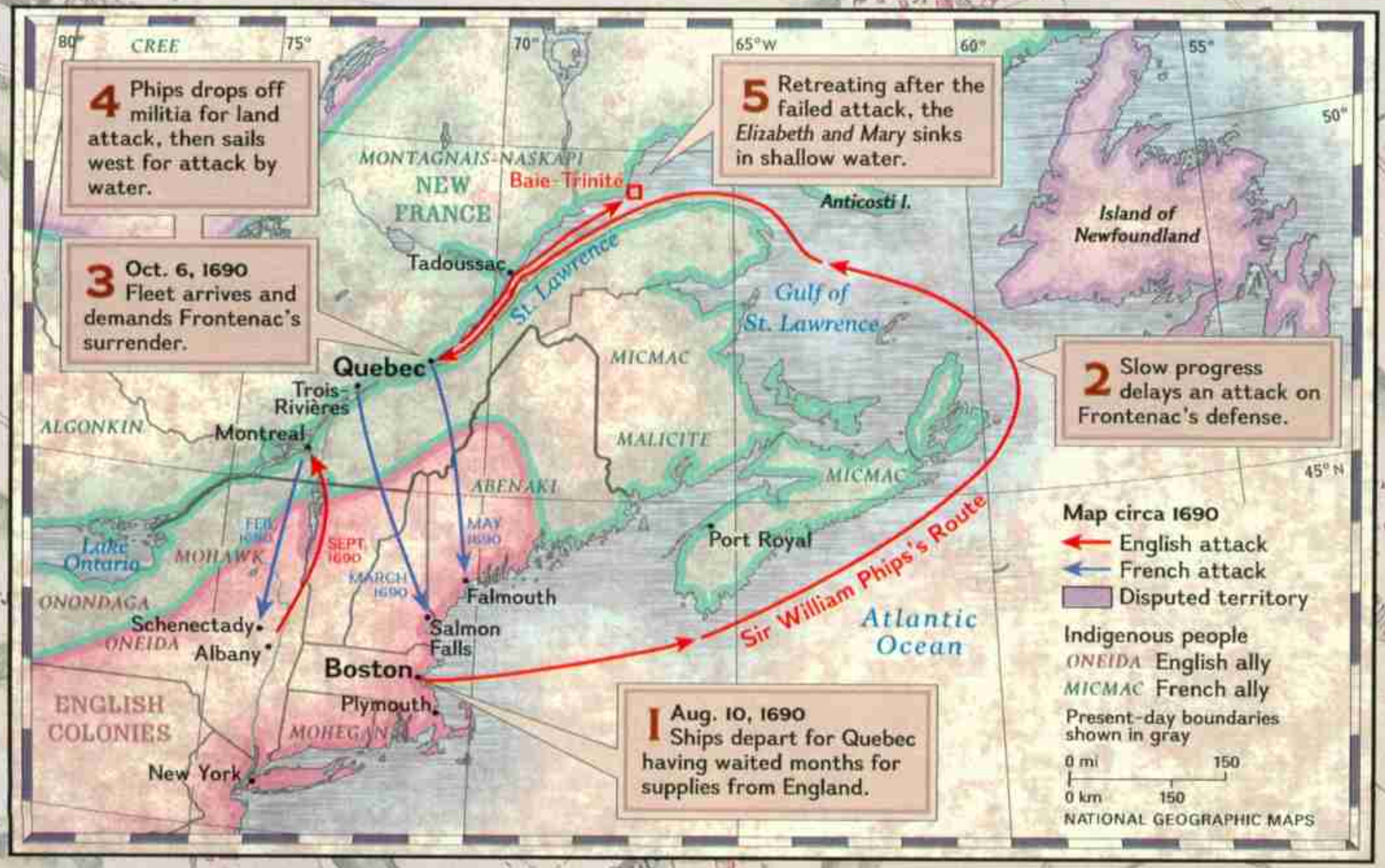
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45°

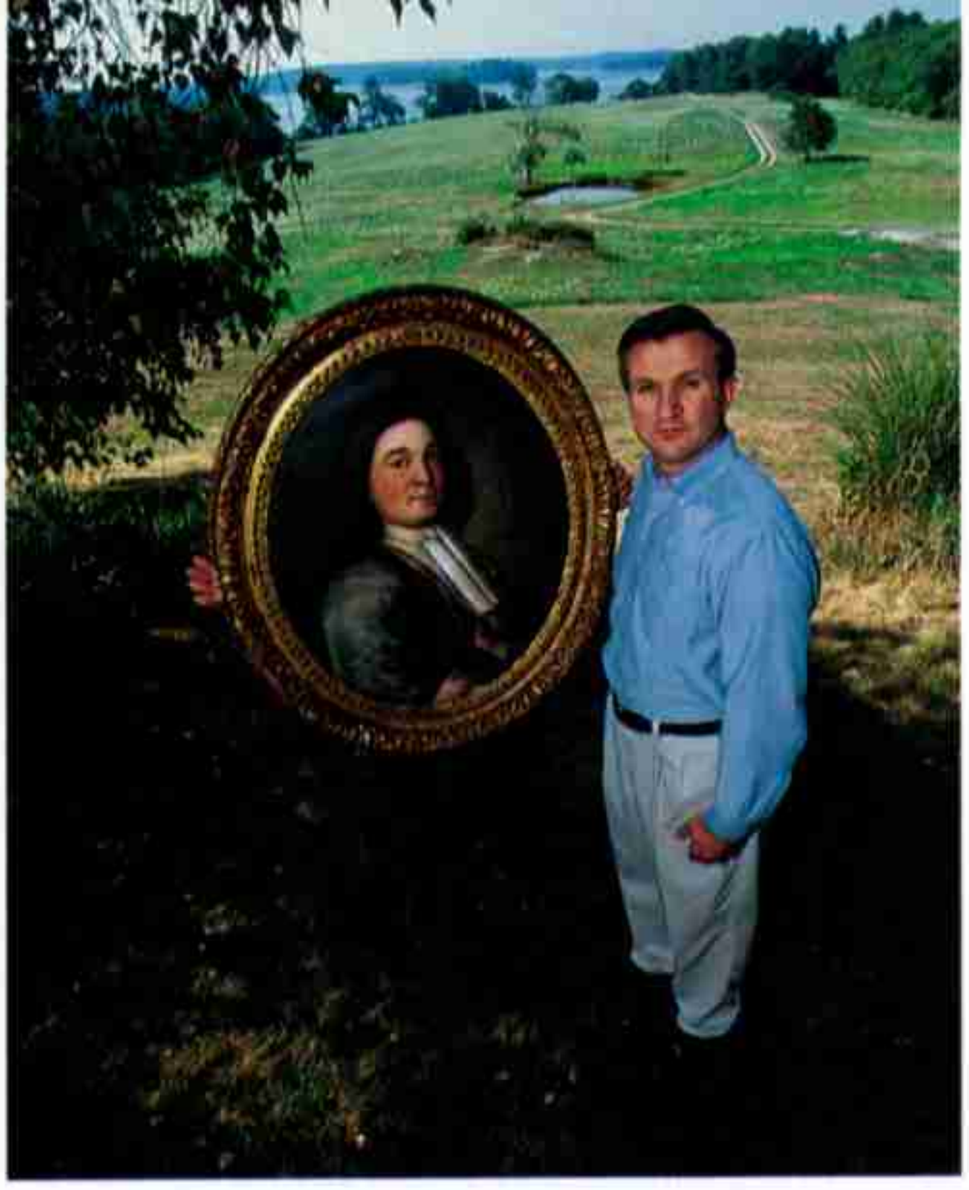
44

16

boi.



"1690 SIEGE OF QUEBEC," HARVARD MAP COLLECTION





THE Players

Phips was born in a house his father built with a partner in Maine. His father died, his mother married the partner, and their descendant Frank White (top, with portrait of Phips) now visits the site to assist archaeologists. Lowered from the Parliament building for cleaning (above), a statue of Quebec's defender, Frontenac, usually gazes over waters where the English, flying the Union flag (opposite), attacked.

help of Tremblay and other local divers gingerly reburied the artifacts with sandbags.

Parks Canada experts suspected that the wreck was from Phips's expeditionary fleet. They returned that spring. Now, after two seasons of excavation and several years of studying the retrieved items, they are convinced they have opened a window on a key event in North American history.

IN THE WINTER of 1689-90 the French and their Native American allies raided English settlements to the south. Fighting back, the English staged a two-pronged assault: by land on Montreal and by sea—under Phips's command—on Quebec. The two forces were supposed to strike simultaneously, but bad weather delayed the sea convoy. The Montreal attack was a complete failure, and by the time Phips's ships arrived at Quebec, French reinforcements had already arrived.

Unaware of the reinforcements, Phips sent an officer ashore to demand the surrender of the legendary French commander Louis de Buade, Comte de Frontenac et de Palluau. Frontenac's stinging response: "I have no reply to make to your general except from the mouths of my cannons and by gunshots."

For two days Phips's fleet bombarded Quebec. Phips tried to mount a land attack from the rear and dispatched cannon ashore, but they were set up far out of range. The French returned fire, damaging some ships and killing 30 men. In the end Phips ran out of ammunition. He turned his ships around and headed home.

The defeat was dispiriting; what followed was disastrous. Tossed into confusion by a hasty retreat and punishing storms, the fleet was scattered. Four ships never made it back to Massachusetts.

Those that did make it back fared little better. Diarist Samuel Myles, hoping to draw the king's attention to the colonies, wrote, "Some of the vessells are arrived, haveing lost some halfe their men, some more some even all. . . . Great Complaints there are that there was no suitable Care, nor provision for such an Army, men . . . haveing their Eyes and Cheeks Eaten by Ratts before found."

Hundreds of families lost their breadwinners. Massachusetts, which had invested heavily in the expedition and had planned to cash in on its share of the expected plunder from Quebec, was brought to near bankruptcy.

Now, three centuries later, from several feet of water in the St. Lawrence, the ghosts of Phips's fleet are emerging.

R. JAMES RINGER, a marine archaeologist with Parks Canada, co-directed the excavation. BILL CURTSINGER often works on underwater subjects. He photographed and wrote about tiger sharks for the November 1999 issue.

"I have no reply . . . except from
the mouths of my cannons
and by gunshots."

COMTE DE FRONTENAC



ART BY FRANCIS BACK







Scenes FROM THE Wreck

After more than 300 years in the St. Lawrence River, not much remained of Phips's vessel. A fragment of the port-side hull (above right), its pieces numbered by archaeologists, is the only section to survive.

"The vessel is the bark Elizabeth and Mary," *says Robert Grenier, chief underwater archaeologist for the Parks Canada team, which supervised the excavation. "The ship was a small colonial-built commercial vessel used as a troop and supply transport for the expedition. It is the oldest New England–built*

PETER WADDELL, PARKS CANADA UNDERWATER ARCHAEOLOGICAL SERVICES (ABOVE AND OPPOSITE BOTTOM)

vessel ever excavated."

The team transported most of the timbers to a nearby freshwater lake for reburial. A few were removed to the roof of the Quebec Conservation Center (top left) for outdoor freeze-drying under the supervision of chief conservator André Bergeron.

During the excavation, co-sponsored by Quebec's Ministry of Culture and Communications, a team of marine archaeologists and volunteers spent more than 1,800 hours diving on the site. They uncovered hundreds of personal items (opposite), including pewter tableware, tools, and ceramics.

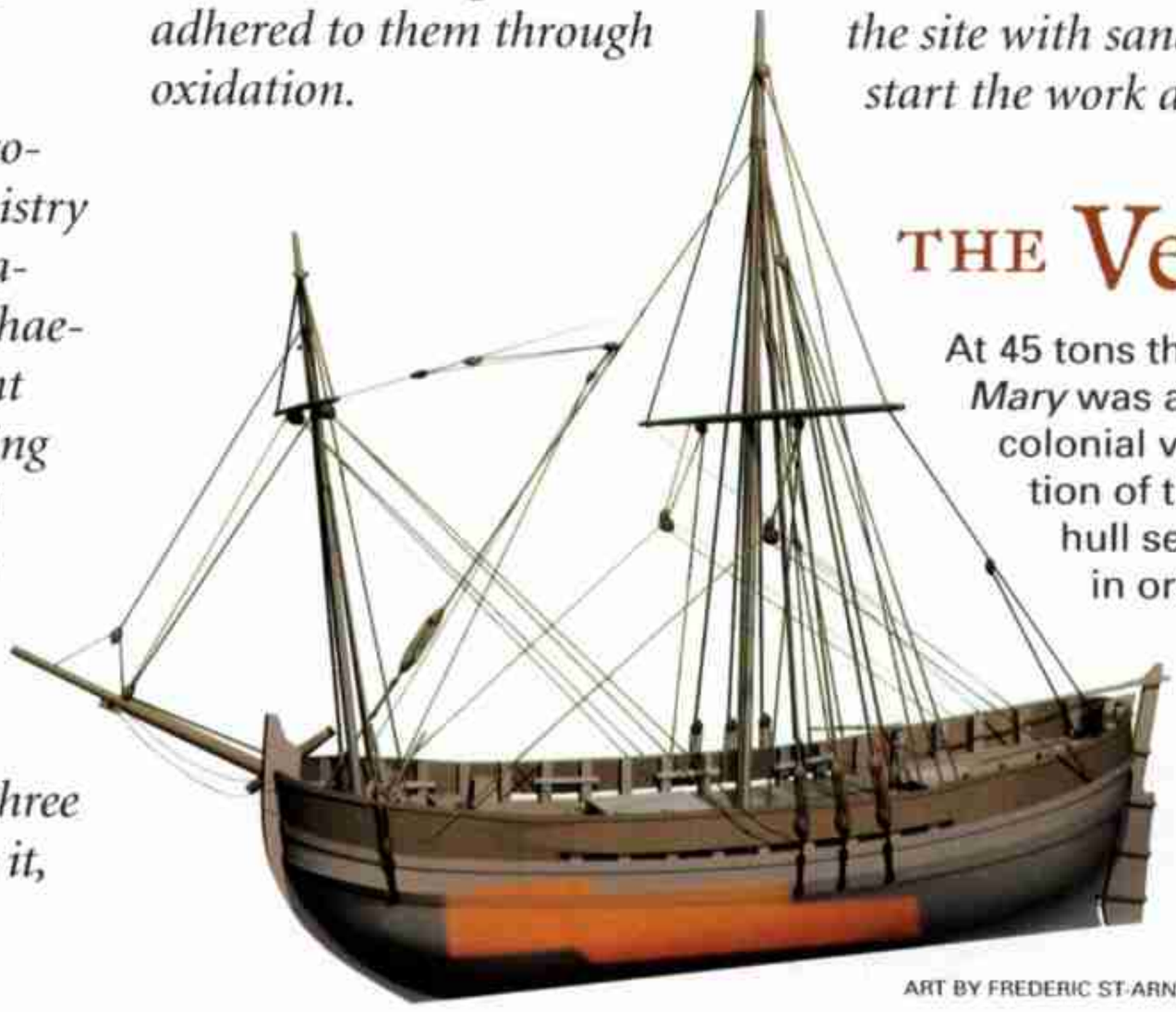
"A glass wine bottle had three sets of initials scratched into it, telling us of three companions sharing a drink," says Grenier.

Hundreds more recovered objects—including two silver broaches—were encased in rock-like concretions, which were formed as microorganisms, sand, and pebbles adhered to them through oxidation.

The shallow waters of the excavation site, no deeper than 15 feet, permitted unlimited diving time, but, Grenier recalls, "It also made the site vulnerable to storm action. On three occasions the team saw violent storms completely cover the site with sand and had to start the work all over again."

THE Vessel

At 45 tons the *Elizabeth and Mary* was an average-size colonial vessel. The location of the surviving hull section is shown in orange.



ART BY FREDERIC ST-ARNAUD

Personal EFFECTS OF War

The men of Phips's fleet were farmers, tradesmen, and townspeople—certainly not sailors. They dressed in their everyday attire. However, discoveries like a silk-covered button, a fragment of a silk ribbon, and fashionable buckle shoes indicate that some expedition members, probably the officers (right, at far right), wore finer clothing.

Of the guns found in the wreckage, many had seen years of use by the time Phips sailed. "Some muskets were likely 60 to 70 years old," says Grenier. Weapons found show signs of modification and repair.

Besides their guns, the militiamen brought their own personal items, including eating utensils such as spoons (below) and ammunition containers like a leather cartridge box (below right). Side arms found include belt axes and swords (opposite). Despite centuries submerged, the items still clearly show decorative flourishes and initials identifying their owners. Each name represents a family that waited in vain for the owner to return with the fleet to Massachusetts.

"Sarah Modsley, widow of the sergeant whose porringer we found, waited 13 years before remarrying," says Grenier. "Others were even more optimistic. Twenty years after the expedition, Ezra Clap made provisions in his will for his son Edward, lost with Phips's fleet, should he ever return.

"He never did." □



ART BY FRANCIS BACK

Battle GEAR

1. Matchlock musket converted to flint
2. Lace-up shoes
3. Cloth-covered wooden buttons
4. Bandolier with pouches for powder
5. Doglock musket
6. Cartridge box
7. Belt ax
8. Crossbelt
9. Pistol
10. Brass butt cap for powder horn
11. Sword
12. Buckle shoes





The Temples of Angkor

STILL UNDER ATTACK

GRIPPED BY ROOTS *of a strangler fig tree, Ta Prohm is one temple in the great Cambodian complex of temples called Angkor, famed capital of the ancient Khmer Empire. For centuries a crucible of Hindu, Buddhist, and native Khmer culture, Angkor now faces other pressures—tourists who love it and looters who plunder it. Preservationists seek to keep the sacred stones in their proper place (below).*



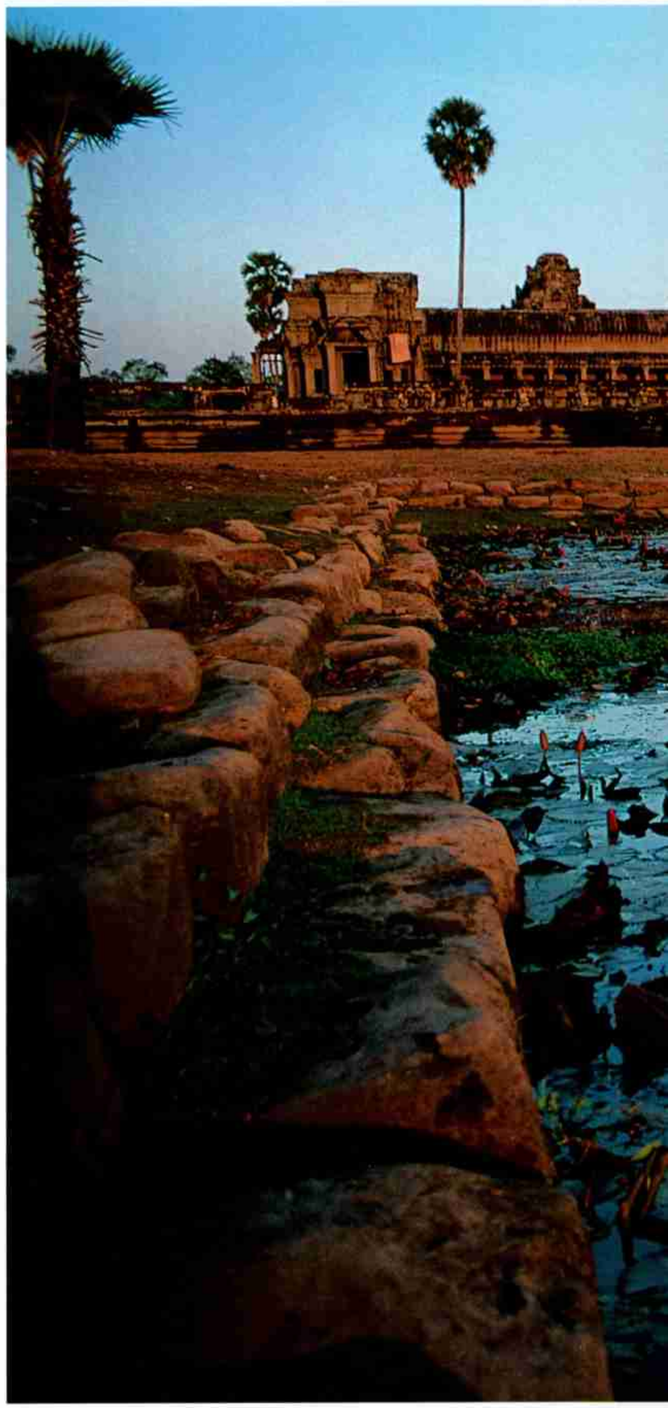
BY DOUGLAS PRESTON

PHOTOGRAPHS BY STEVE McCURRY

Foreigners don't go to Banteay Chhmar, for good reasons. The ancient Khmer temple sits on the lawless northern frontier of Cambodia, throttled by malaria-infested jungle. The area is land-mined, banditry is rife, and the roads are barely passable. In short, Banteay Chhmar is a tempting destination only for those who like to get way off the beaten path. I had come here to explore one of the world's most enigmatic civilizations: the Khmer Empire, centered at Angkor, which thrived from the 9th century to the 15th century. I also wanted to see firsthand how its great temples and monuments had weathered three decades of war, famine, and civil strife.

At its height in the 12th century the Khmer Empire stretched across Southeast Asia from present-day Thailand to Vietnam. Its trading networks reached into China, yet we know very little about it. Its extensive libraries of writings on palm leaves or animal skins vanished without a trace centuries ago, leaving us only a scattering of puzzling stone inscriptions. The immense wooden cities of the empire rotted so completely into oblivion that we now have only the vaguest idea of where they once were. For a time the modern Khmer largely forgot their glorious past, although they are essentially the same people as their imperial forebears, speaking the same language and practicing many of the same traditions.

Only the temples, sacked and stripped to stone and brick, survived the fatal embrace of time and the jungle. Angkor Wat, the largest and most famous of them, became a Buddhist monastery, and the monks kept it clear of vegetation and in modest repair. More than a thousand other temples, some nearly as impressive, remain scattered about Southeast Asia.



WITH A HEAVENLY GAZE *a Hindu* devata, *or divinity, has guarded the sanctuary at Banteay Srei since the tenth century. Today, though, most Cambodians are Buddhists, their spiritual touchstone the temple of Angkor Wat (right). Pilgrims who journey here sustain a tradition by offering lotus flowers to the site's Buddhas. Angkor Wat, said a 17th-century missionary, is as renowned among the region's people "as Rome is among the Christians."*

Banteay Chhmar is one of the most intriguing, and least known, of these abandoned temples. Accompanied by a driver and an interpreter, Yeang Sokhon, I traveled along Route 6, the main highway across Cambodia and the primary route for smuggling antiquities out of the country. Many of the bridges along the way had been blown up, and we had to drive on wobbly planks laid across the wreckage. Long stretches of road were underwater, and the rest of the highway was cratered with potholes twice the length of our four-by-four. By the time we reached Banteay Chhmar eight hours later, I had blisters from grasping the handgrips on the ceiling.

We parked on the outskirts in the shade of a gum tree and stretched our aching bodies. The ruin of Banteay Chhmar lay a quarter mile distant, concealed in the forest. We hiked across fields and forced our way into the undergrowth. Soon a massive wall of greenish sandstone, covered with spectacular



Angkor's Grand Plan



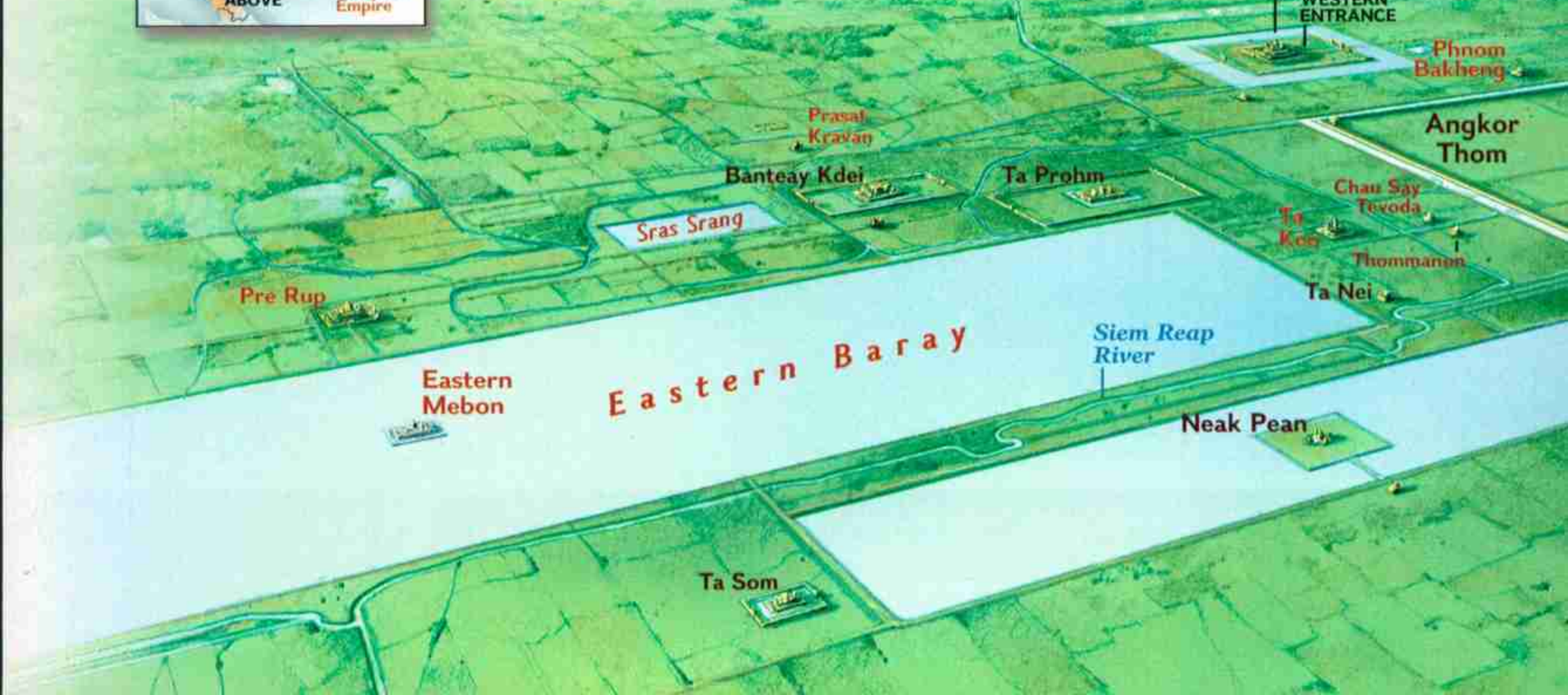
CROWN JEWEL *of the former Khmer capital, Angkor Wat today (right) is the largest and best preserved of the more than 100 temples in the 75-square-mile Angkor complex. From the 9th to 13th centuries Khmer kings typically consecrated their reigns by building new temples. The temples were part of a much larger project that spanned generations. A vast network of dams and canals captured water flowing from nearby hills, enabling the Khmer to enjoy an extra rice harvest each growing season, which helped sustain the empire for more than 500 years. Rectangular reservoirs called* barays *were symbolic as well as practical: They represented the waters of the cosmos.*

bas-reliefs, loomed up ahead. The enormous temple—it covers more than 500,000 square feet—was submerged under giant silk-cotton trees, thick bushes, banyans dropping curtains of vines, and rank, steaming vegetation.

As we turned a corner, we came to a broad path freshly macheted through the jungle, littered with cigarette butts and candy wrappers. Puzzled, we followed the path and arrived at a scene of destruction. Looters had pulled down a section of the south wall that was covered with bas-reliefs of a battle. Fresh broken stone lay everywhere. Woody vines dangled in empty air in crazy geometric shapes, still following the pattern of blocks they had once threaded.

Sokhon picked up a cut tendril. "Look at this," he said, his voice shaking. "The leaves aren't even wilted. This is still going on *right now.* We've got to leave immediately."





THE LOOTING of Banteay Chhmar is a symptom of the worldwide fascination with the ancient Khmer and their mysterious works. The past three decades have witnessed an astonishing increase in the value of Khmer art.

When the French naturalist Henri Mouhot, exploring Southeast Asia, came across Angkor Wat in 1860, he could hardly believe his eyes. He asked the local Cambodians if they knew who had built this stupendous structure covering nearly 500 acres. They shrugged: Who else but giants, or the king of the angels?

Angkor Wat does not look like the work of mortals. One of the largest and most beautiful religious monuments ever built, its architecture is so removed from our Western aesthetic that it defies comparison.

I first visited Angkor Wat early one morning. It stands by itself, surrounded by walls and a moat, in a clearing in the forest several miles outside Siem Reap in northwestern Cambodia. Angkor Wat's five great towers, symbolizing the center of the Hindu universe, stood dark against the brightening sky. The scent of lotus flowers and woodsmoke from a nearby monastery perfumed the air. Orange-robed Buddhist monks moved silently down a path, carrying their begging bowls, on their way to town. I could hear the faraway sound of chanting.

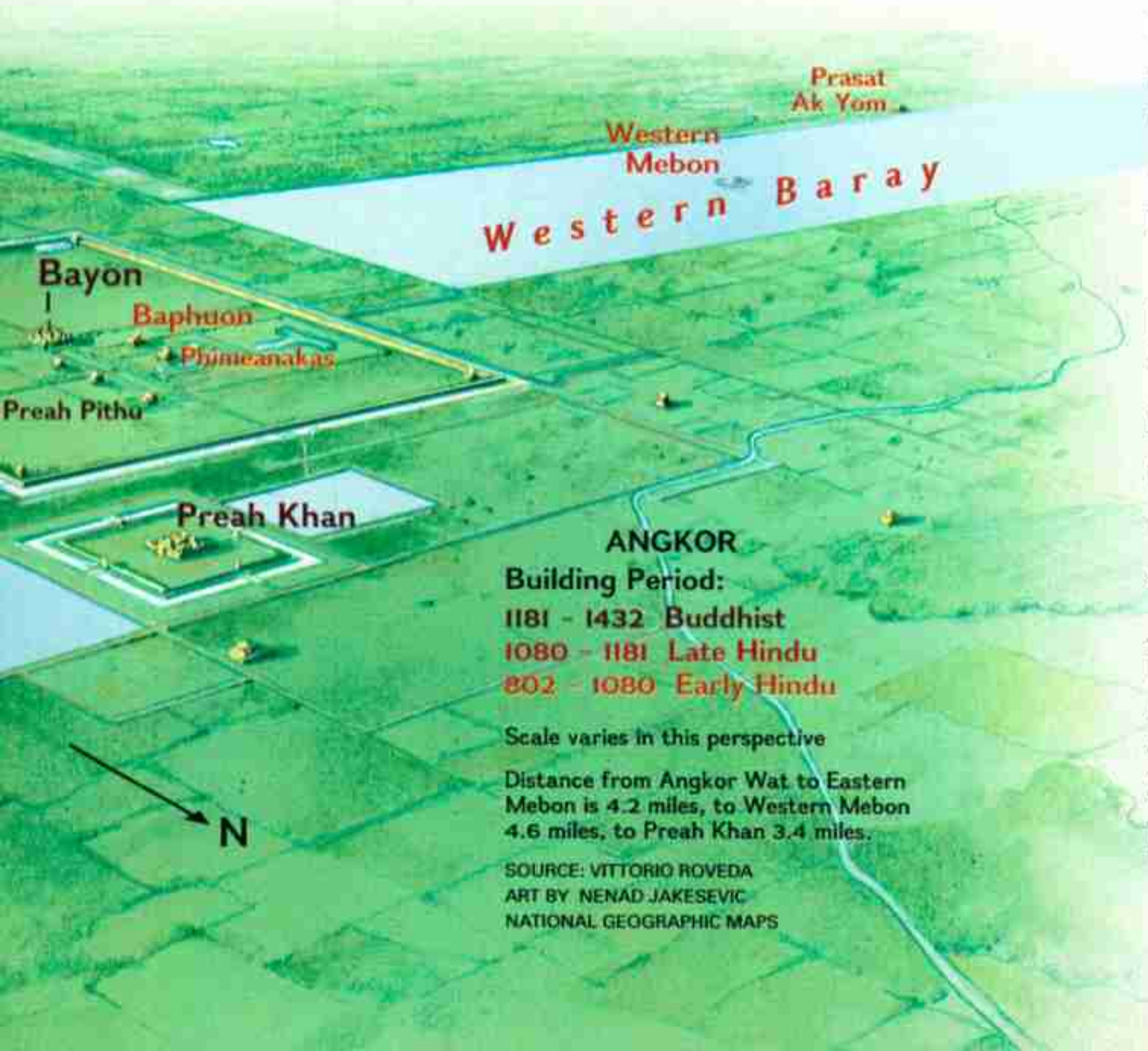
A distant bell rang, and the chanting died away. At that moment the Asian sun erupted over Angkor Wat, pouring rivers of light through the stone porticoes, galleries, and causeway, illuminating carved lions, seven-headed snakes, goddesses, celestial dancers, and demons. It was a moment that had occurred countless times in Angkor Wat's 900-year history, and yet its magic was still fresh.

The kingdom of Angkor began to flourish in the ninth century along the northern shore of the Tonle Sap, the Great Lake, which dominates the center of Cambodia. The Tonle Sap was to the Khmer what the Nile was to the ancient Egyptians. During the monsoon season the Tonle Sap quadruples in size. When the dry season returns, water flows out of the lake, leaving a fertile layer of mud.

Long ago the Khmer learned to divert the retreating water to increase rice production. As the population increased, the Khmer began to manage water ever more intensively, not only for agriculture but also for religious purposes. They created broad moats around temples and built immense sacred lakes called *barays,* symbolic of the oceans surrounding mythical Mount Meru, the center of the universe. Such works required centralized planning and the hand of an absolute ruler—the god-king. The resulting rice surpluses freed labor for other uses, notably constructing the god-king's temples. Most Angkor kings wanted to build their own monuments, leading to a proliferation of temples; there are hundreds scattered in a broad swath north of the Tonle Sap. In the 12th century the capital of Angkor may have embraced a population of one million. By comparison Paris, one of the great cities in Europe at the time, had a population of perhaps 30,000.

King Suryavarman II constructed Angkor Wat in the early 12th century after seizing power by killing his great-uncle. Suryavarman ruled vigorously, expanding the empire and establishing diplomatic relations with China. He vanished around 1150 —possibly murdered—and was likely buried here, in Angkor Wat.

Toward the end of the century a new king came to the throne, Jayavarman VII. Jayavarman would become Angkor's greatest ruler. He was a contradictory man, a devout Buddhist mystic who waged war, expanded the empire, and exacted tribute. His statues portray



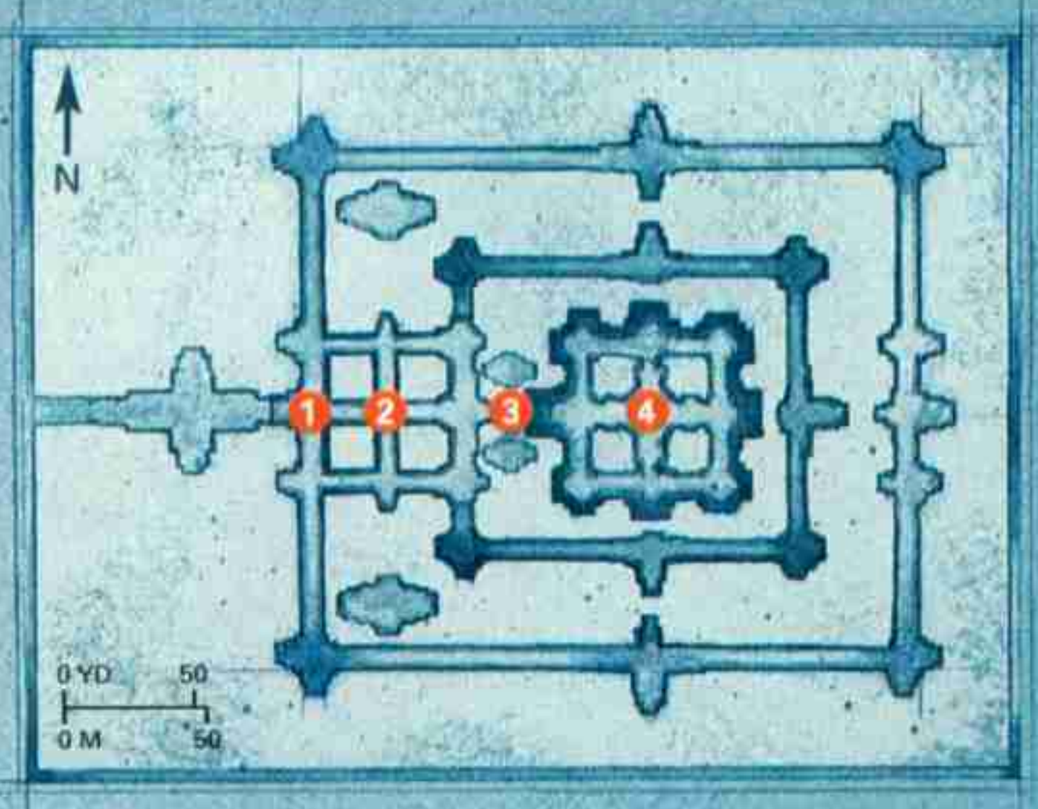
DOUGLAS PRESTON is the co-author of *Thunderhead,* a novel about an archaeological expedition in search of a lost Anasazi city. STEVE MCCURRY, a frequent contributor, has photographed Asian subjects since 1978.

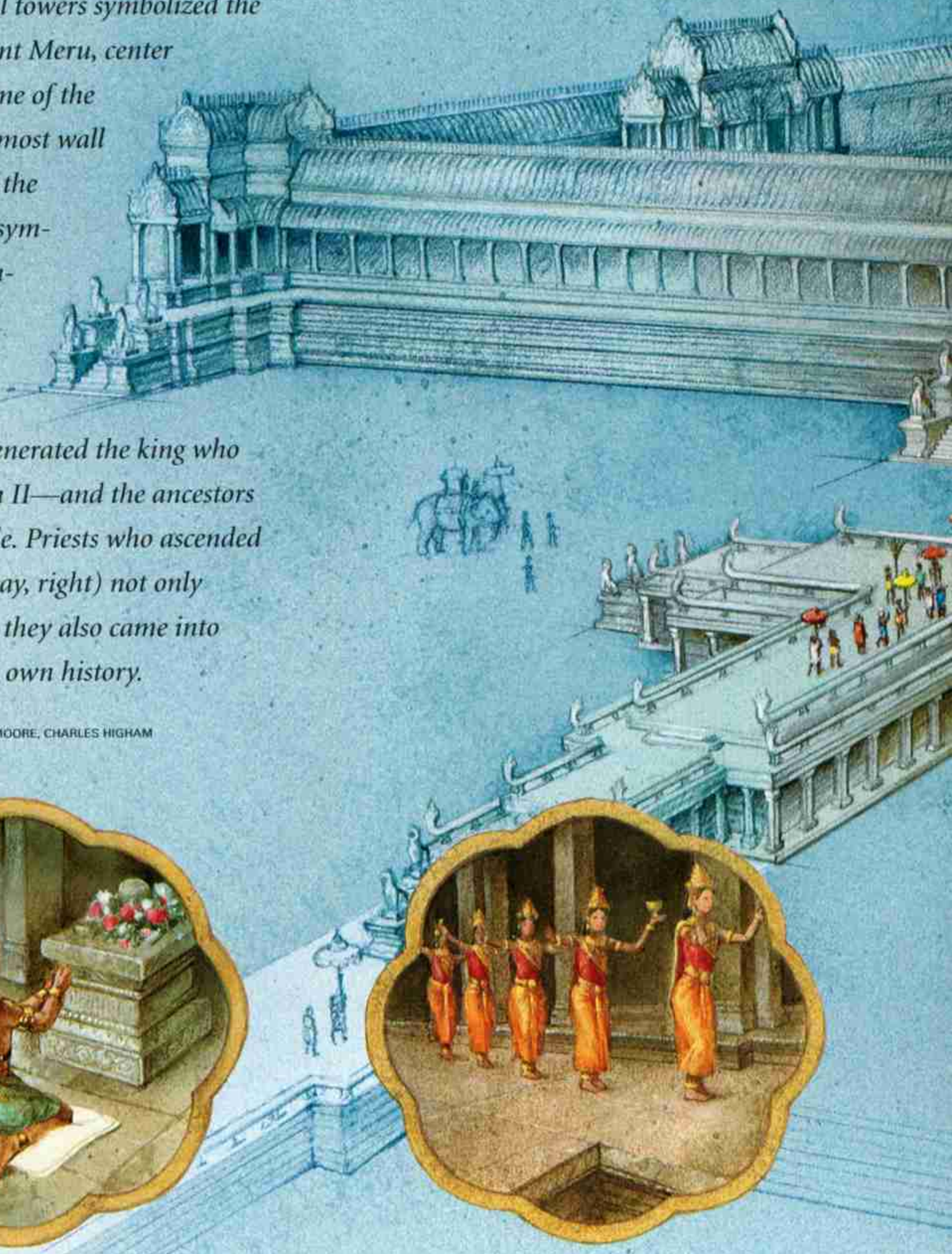
Angkor Wat

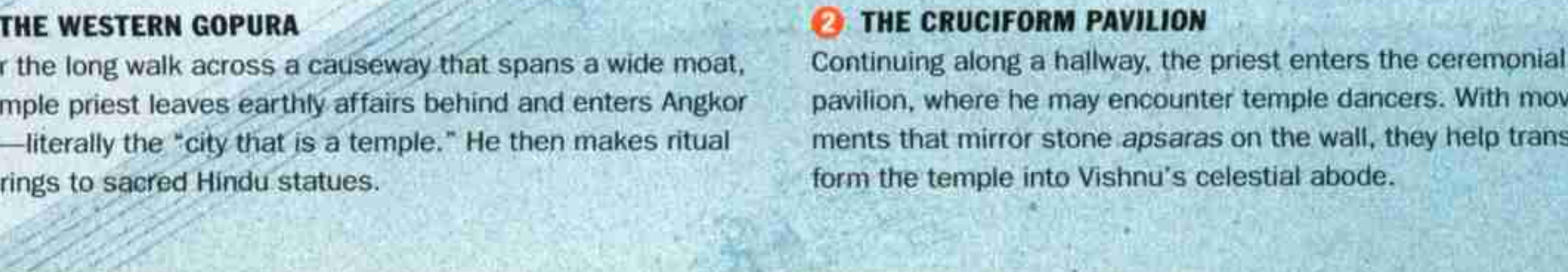


What exactly was Angkor Wat? To the ancient Khmer it was a temple, a shrine, a mausoleum, an observatory, a public works project, and a source of national pride. It was also a physical representation of Hindu cosmology, a worldview set in stone. The central towers symbolized the mythical peaks of Mount Meru, center of the universe and home of the Hindu gods. The outermost wall represented the edge of the world, while the moat symbolized the oceans. Constructed in the 12th century and dedicated to the Hindu god Vishnu, Angkor Wat venerated the king who built it—Suryavarman II—and the ancestors who made it all possible. Priests who ascended the central axis (cutaway, right) not only entered a sacred space, they also came into communion with their own history.

ART BY NENAD JAKESEVIC
SOURCES: VITTORIO ROVEDA, ELIZABETH MOORE, CHARLES HIGHAM







1 THE WESTERN GOPURA
After the long walk across a causeway that spans a wide moat, a temple priest leaves earthly affairs behind and enters Angkor Wat—literally the "city that is a temple." He then makes ritual offerings to sacred Hindu statues.

2 THE CRUCIFORM *PAVILION*
Continuing along a hallway, the priest enters the ceremonial pavilion, where he may encounter temple dancers. With movements that mirror stone *apsaras* on the wall, they help transform the temple into Vishnu's celestial abode.



3 BASE OF THE CENTRAL TOWER
After emerging from the temple's shaded interior, the priest gazes up at the central shrine of Vishnu, more than 200 feet above ground level. Climbing the steep staircase is part of the ritual act of separating from the earthly realm.

4 VISHNU SHRINE
Here, atop Mount Meru, the great god Vishnu appears. Here the Khmer people encounter the divine presence. And here, at this cosmic vortex, the priest is enveloped and embraced—by the blessings of heaven and by the history of his people.

him deep in meditation, smiling with half-closed eyes, detached from worldly things, and yet he embarked on vast building projects to his own glory that required the labor of hundreds of thousands, many of whom were slaves. He also kept hundreds of concubines.

Just north of Angkor Wat, Jayavarman built a walled city of temples, pools, and terraces—Angkor Thom, or Great City. At the center he raised his state temple, the Bayon.

If Angkor Wat is the classical Khmer ideal, the Bayon is its Gothic sibling, replete with crooked passageways, dark galleries, forests of stone pillars. Fifty-four towers rise from its ramparts, each carved with four gigantic, smiling faces. The French archaeologist Maurice Glaize called it a "muddle of stones, a sort of moving chaos assaulting the sky." Visited at night under a full moon, wreathed in mist, with bats streaming from its dark towers, the Bayon offers its own eerie kind of charm.

Unlike at Angkor Wat, in the Bayon we finally meet the common folk of ancient Cambodia. The bas-reliefs, full of vitality and irreverent humor, depict such daily activities as cockfights with bookies taking bets, an ascetic

LOOTERS BEHEADED *a devata and have removed countless other artifacts to sell in the lucrative market for stolen antiquities. Angkor's managers have mobilized a security force—a first for a World Heritage site. Guards have helped reduce theft at Angkor Wat, but looters now plunder other sites, such as an ancient wall at Banteay Chhmar near the Thai border (above right).*



trying to strip a girl of her sarong, and a man with a sliver of mirror tweezing hairs from his chin. One scene shows several smiling Cambodian ladies cheating three Chinese people in the marketplace: One of the ladies is secretly adding weight to the scale with her finger. Most of the scenes depicted on the Bayon's galleries can still be seen in Cambodia today.

Jayavarman died mysteriously around 1220, and Angkor civilization went into decline. The last stone temple at Angkor was built around 1290. Around 1430 Siam invaded from the west, and the fleeing Khmer abandoned Angkor, eventually establishing a new capital at Phnom Penh. The implacable forest crept back in, entwining all in its muscular embrace.

The past three decades of war and unrest at the hands of the Khmer Rouge have exacted a heavy toll on Angkor's temples. Because they were built on high ground or hills, they often became the scene of firefights and sieges, leaving them scarred by bullets, shrapnel, and mortar fire, as well as heavily mined.

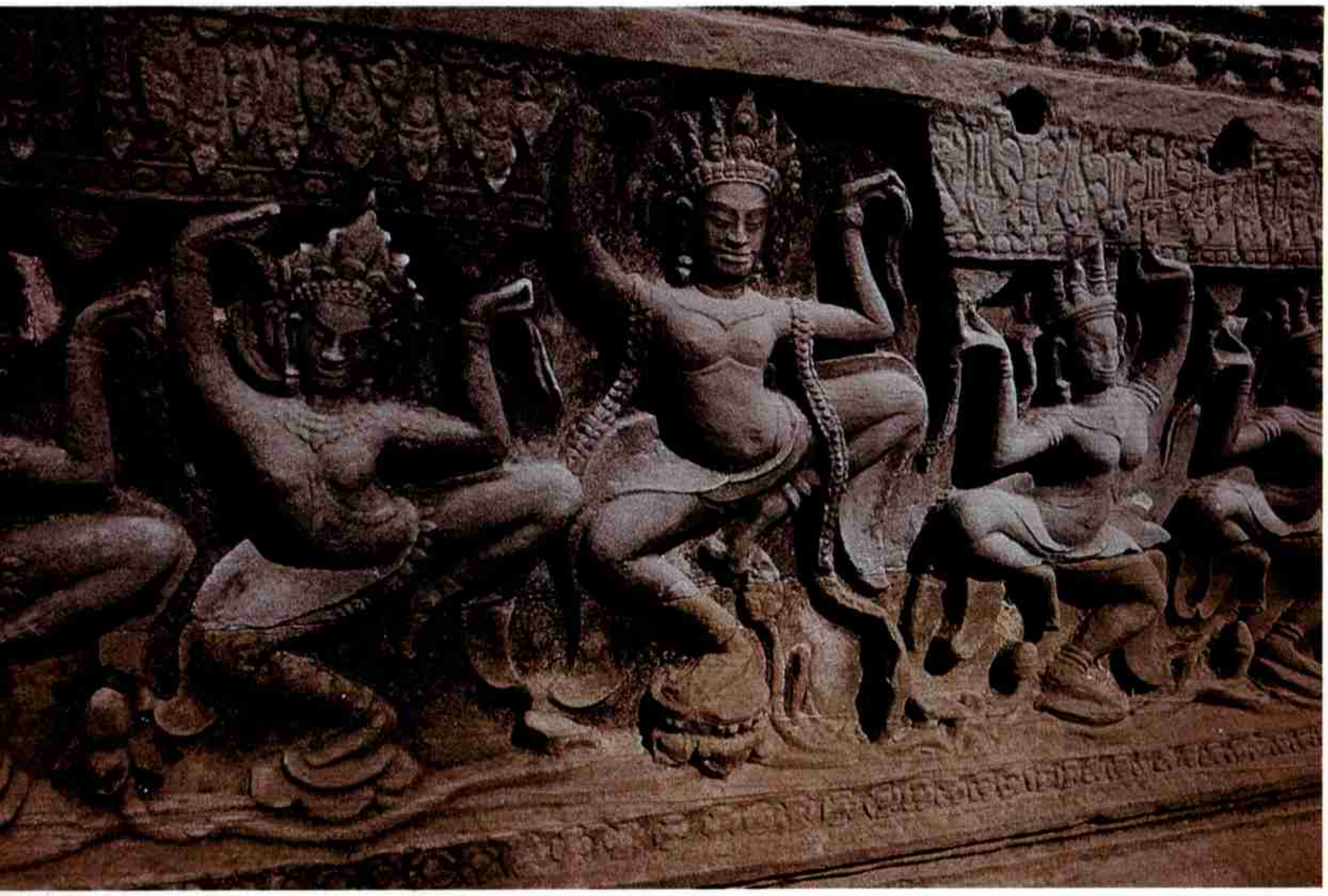


Looting has caused even more destruction than war. At Angkor Wat scarcely a freestanding statue retains its head, while many statues have disappeared entirely. In the 1980s the Cambodian government removed most freestanding sculptures and stored them in a guarded warehouse in Siem Reap. Even so, armed bandits attacked the warehouse and made off with priceless works. Today the worst pillaging has shifted to hundreds of outlying temples, such as Banteay Chhmar.

It takes no special insight to see why looting would be endemic to Cambodia, one of the poorest countries in the world, still swept by periodic famine. A poor farmer who finds a sculpture in his fields or a soldier who plucks one from a temple at night knows that if he sells it to a smuggler, he will be able to feed his family for several years.

Banteay Chhmar, being isolated and close to the Thai border, makes an especially attractive target. Scholars have long puzzled about this beautiful temple, which Jayavarman VII built in a singularly inhospitable location, even then a malarial backwater. One theory says that Jayavarman erected it to honor his son and several others killed in a battle. All I knew was that after risking life and limb on Route 6, I was not about to flee before I had seen the temple myself, despite the danger of running into looters.

After examining the wrecked gap in the temple's south wall, Sokhon and I pushed our way around to the west wall—and stumbled on an even more horrifying scene of destruction. The entire wall was in the process of being dismantled. Already a section 8 feet high and 36 feet



long was gone. Some of the remaining blocks had been marked with purple numbers, ready to go. Hundreds of broken reliefs and shattered sculptures lay among piles of stone chips where looters had evidently chiseled off the backs of the blocks to lighten them for transport.

This was despoliation of a different order than what had occurred at places like Angkor Wat. It seemed the entire temple was being disassembled for sale on the black market. According to Claude Jacques, an authority on ancient Cambodia and one of the few Westerners to have visited the site, this wall once bore six-foot images of Lokeshvara, beautifully carved in relief, showing the Buddhist divinity with multiple heads and arms.

Sokhon appeared with a look of sick fear on his face. "There are fresh tire tracks back there, made by a military vehicle."

I put him off again. Through a screen of vines I could see a ten-foot-high stone head with a gentle smile on its face. Along the eastern wall I finally found a path leading into the inner precincts of the temple. I scrambled along the path, ducking through fallen doorways, climbing over piles of mossy blocks, and feeling my way along dark corridors. Everywhere the roots of silk-cotton trees snaked through the buildings like pythons, squeezing and heaving apart the stones. Delicate ferns drooped from a pair of lions. A ferocious *garuda*—half bird, half human—peered from under a mantle of rotting leaves. Heavenly dancing maidens smiled out of the vegetative brawl, their bare stone breasts glistening with the damp. And yet everywhere were the marks of chisels and power tools, leaving fresh scars on the stone. Deep in the temple I came across the butt end of a stela chiseled off at the base. The stone monument would have contained an inscription relating to the temple —priceless information for archaeologists.

I climbed up onto the roof of a sanctuary. There I sat, trying to take notes, my glasses fogging up in the steamy heat, the sweat running over my notebook.

Sokhon came up beside me. "Please," he hissed. "We *must* go."

I gave up on the notes and looked around. In the treetops hundreds of yellow and orange butterflies bobbed about. Stone towers, dappled with sunlight, ranged about me, each with four smiling faces. Banteay Chhmar is one of the few temples in Southeast Asia



CELESTIAL SPIRITS *carved in stone, ancient apsaras adorn the Hall of Dancers at Preah Khan, where members of a traditional Khmer dance troupe prepare to entertain tourists. Khmer culture almost vanished during the bloody reign of the Khmer Rouge communists in the 1970s, but Cambodians today are reclaiming their national inheritance.*

outside Angkor Thom with towers of carved heads. I heard a faint sound like the patter of water: A gum tree was dropping tiny flowers all around me.

"All right," I said. "Let's go."

At the edge of the forest we encountered a bent old man with long hair, standing in the doorway of a hut—a Buddhist hermit.

"Ask who's been looting the temple," I said.

Sokhon turned to the man and spoke. The hermit responded, his expressive face popping and wrinkling with emotion, his brown hands gesturing. Whatever he was saying, I could see that it was frightening Sokhon even more.

"He says that 15 to 20 soldiers have been coming every day with AK-47s. The last four days they've been working night and day."

"What soldiers?"

"From the local post. The commander is part of it."

"Where's the stuff going?"

"To Thailand."

A WEEK LATER I flew to Bangkok on the off chance I might be able to track down some of the reliefs. Dealers show their wares at the River City shopping complex, next to the Royal Orchid hotel. I booked a room at the Orchid, shaved, put on a jacket, and slicked back my hair, hoping to look like a rich American collector.

I needn't have bothered. The sale of Khmer loot in Bangkok could not be more brazen. The first store I went into was wall-to-wall with Angkorean sculptures, all openly labeled as such. At one shop I pointed to a 12th-century carving of a garuda and asked, "Is this stolen?"

My question was greeted with a mock show of horror. "Oh, no. This come up from underground." The back of it, however, sported fresh chisel marks.

"How does it get here?"

The dealer rummaged in a drawer and pulled out a sheaf *(Continued on page 100)*





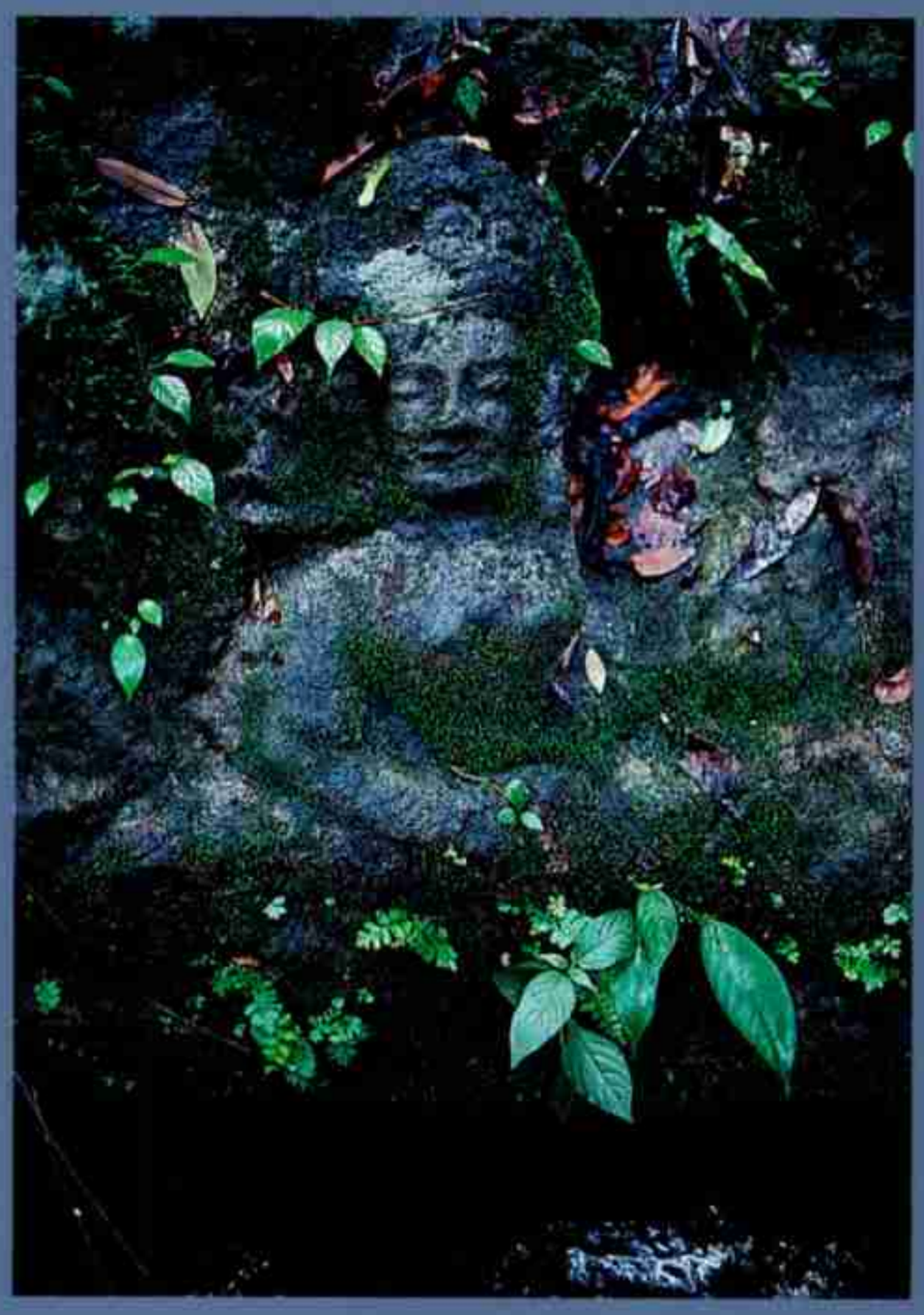
CRAFTING TEMPLES *with stone blocks, Khmer kings hoped to leave something to posterity. At the crumbling core of Angkor's Preah Khan, rubble hints at the glory that once was. By contrast the kings' palaces and commoners' homes were built from wood and have long since disappeared.*





A Cascading Blessing

When the ancient Khmer embraced Hinduism, they also devised a symbolic sacred geography that reflected their new faith. The relatively modest hills near Angkor, for instance, represented the mighty and quite distant Himalaya, mountain home of the Hindu gods. The waters of Kbal Spean—Khmer for "bridgehead"—represented the holy Ganges River. In this rocky riverbed Khmer artists sculpted a gallery of gods, including one relief depicting Vishnu, the preserver deity, reclining on the great serpent Ananta (above). Other sections (left and right) portray gods and celestial beings who consecrated the waters that helped sustain Angkor.



of Polaroids. "It come in at Poipet," she said, naming the Cambodian border town where Route 6 enters Thailand. "They send me photo, I buy. You like any?" She shoved the wad of photos into my hand. "Whatever you want, I get you. No problem."

In another elegant store I discovered a four-block section of temple wall marked "12th century Khmer." It pictured a smiling *devata,* or goddess, dressed in a diaphanous *sampot* skirt, bare from the waist up, one hand holding a lotus. It had been carved from the same greenish sandstone used at Banteay Chhmar. The front of each block had a faint number in purple marker—the precise color I had seen on the temple wall at Banteay Chhmar—evidently put there so the blocks could later be reassembled. A salesperson, noting my interest, glided over.

"For you, I give Special Friend Price." She punched a number into her calculator and held it up to me with a dazzling smile: $10,555. It was in fact a low price for a piece that could fetch $50,000 in New York.

When I reported the looting at Banteay Chhmar to Cambodian authorities, I began to understand why it is so hard to control. Officials in Siem Reap said that Banteay Chhmar lay outside their jurisdiction. Faxes to the Cambodian Ministry of Culture got no response. A few weeks after my visit Claude Jacques came face-to-face with a stone stela in a River City antique store; on it was an inscription in Khmer that he recognized as coming from Banteay Chhmar. He alerted Thai officials, who had the piece confiscated. Shortly thereafter, Thai authorities seized a truck carrying 117 stone blocks; when the image was assembled, it formed a temple wall roughly 8 feet by 30 feet decorated with large images of Lokeshvara—



part of the missing wall of Banteay Chhmar. Later Jacques and a group of preservation officials made the arduous journey to Banteay Chhmar. When Jacques saw what had happened to the temple, he had to fight back tears.



CAMBODIA IS ONE of the few places left in the world where you can discover a "lost" temple. In 1996 the Jet Propulsion Laboratory (JPL), an arm of NASA, flew a DC-8 across northwestern Cambodia. The plane was equipped with imaging radar that could penetrate dense foliage. Its purpose was to map the temples and waterworks of Angkor to aid in preservation efforts.

Anthony Freeman and Scott Hensley, radar



GENTLEMEN AWAIT THEIR CUE *from a wedding photographer at Angkor Wat, a backdrop that gives any event the gravitas of history. Tourists have flocked here too, especially since the end of Cambodia's civil war. Beneficiaries: Local artisans who make souvenirs, such as a stone head of Jayavarman VII (left, at left)—the late 12th-century king who declared Buddhism the state religion.*

specialists at JPL, processed the data into false-color images that revealed never-before-seen details of Angkor Wat, Angkor Thom, and dozens of other ancient temples, roads, reservoirs, and earthworks. The radar also picked up two odd features northwest of Angkor Wat. The project's archaeologist, Elizabeth Moore, head of the Department of Art and Archaeology at the University of London and an authority on Angkor civilization, worked with the JPL scientists in identifying the features. To their delight they realized that the radar imagery revealed two large temples buried in the forest.

After returning from Banteay Chhmar, I joined up with Moore, Freeman, and Hensley, who had come to Cambodia to search for one of the uncharted temples. Called Nokor Pheas, the temple lay less than a day's journey from Angkor Wat. On the morning of our expedition we made the rounds of several government offices, seeking permission to enter what was still a very dangerous area. We finally ended up in a bullet-pocked concrete room in the village of Puok talking to Pol Samroch,

governor of the district, a handsome man with a livid scar on his jaw, a brilliant smile, glittering eyes, and an elaborately courteous manner.

When Samroch heard our plans, he shook his head; regrettably, it was impossible to go to Nokor Pheas. The week before, a Khmer Rouge splinter group had invaded the nearby village and kidnapped three people and were holding them for ransom in the forest. Besides, he said, there were no roads to Nokor Pheas. The trails were flooded and mined.

I thought this would be the end of it, but Moore cheerfully countered his objections. We would go on motorbikes, she said, which were less likely to set off mines. We would pay for an armed escort. And as for floods, no one had any objections to wading. Faced with Moore's friendly determination, Samroch gave in. Opening his hands, he said, "Let us go then."

All four of the officials involved in these negotiations came along. We drove deep into the countryside. At the end of the road we were met by our escort—four motorbikes carrying 12 soldiers and policemen bristling with machine guns and mortar launchers.

We climbed on the back of other motorbikes and took off in a tinny chorus, weaving single file along a rutted track between rice fields. After hours of travel through forests and hamlets we came to the village of Nokor Pheas.

Our arrival caused a sensation: The villagers had never seen Westerners before. Moore, following her custom, asked for the headman. He soon arrived, a skinny, dignified old man without a shirt. They squatted in the sand under silk-cotton trees while Freeman and Hensley laid out the radar images and everyone crowded around. To my surprise the headman quickly understood the images and was able to interpret them. He pointed out the location of the temple, a mere quarter mile distant.

We were tremendously excited. Soon we would be the first outsiders to see this great ruin. Nokor Pheas means "city of refuge" in Khmer, and Moore suggested that the temple might have been a retreat for ancient Angkor kings during war or times of upheaval.

A short walk brought us to the top of a low hill on which stood the concrete shell of a bombed-out Buddhist sanctuary. Inside, monks were laying paper flowers at the feet of the Buddha. The wrecked building rested on a much broader foundation of gigantic laterite blocks. Beyond, in some fields, stood several mounds of brick rubble sprouting bushes.

Moore came up, hidden under a straw hat. "This is it," she said. "This is Nokor Pheas."

I looked around. "Where?"

"We're standing on it."

I stared in disbelief. Time, the great leveler, had reduced it to nothing. "But it looked so clear on the radar," I protested.

Freeman arrived, radar maps open. "What you see on radar and what you see on the ground are often very different," he said. The radar, he explained, picked up earthworks, foundations, and reservoirs that are hard to see on the ground because they are eroded and covered with vegetation.

We walked past the ruins, along the top of an ancient earthwork, to a spreading banyan tree.



There, a small spirit shrine stood in the shade. Its thatched roof protected three old stones partly carved with lotus blossoms—all that was left of the temple of Nokor Pheas.

"*Neak ta,*" whispered Moore. "Ancestor stones." They embody the spirits of the village's ancestors, she said. The worship of neak ta was part of the animist religion of Cambodia; during the Angkor period it was incorporated into the Hindu concept of the *lingam,* a sacred stone phallus symbolizing the god Siva kept in the inner precincts of many temples.

I touched one of the neak ta and ran my finger into the cool groove of a carved lotus. Here, broken stones from an Angkor temple had been put in the service of an even more ancient religion. One of our soldiers, a skinny, barefoot teenager with an AK-47 slung over his shoulder, stopped at the shrine, placed his hands together, and bowed deeply in an act of veneration. A gecko called twice, and then the forest fell silent in the stifling noonday heat. Life went on in this strange, timeless land. □

What can be done to help impoverished peoples maintain their antiquities? Comment online at *www.nationalgeographic.com/ngm/0008.*

SACRED SPACE *to Buddhists, like these monks praying at the Bayon, the serene temples of Angkor have long uplifted a people devastated by poverty and war. Aided by international teams of preservationists, Cambodian architects, engineers, and artisans now struggle against time and thieves to document and restore this ancient core of their identity.*



Big Sur

California's Elemental Coast

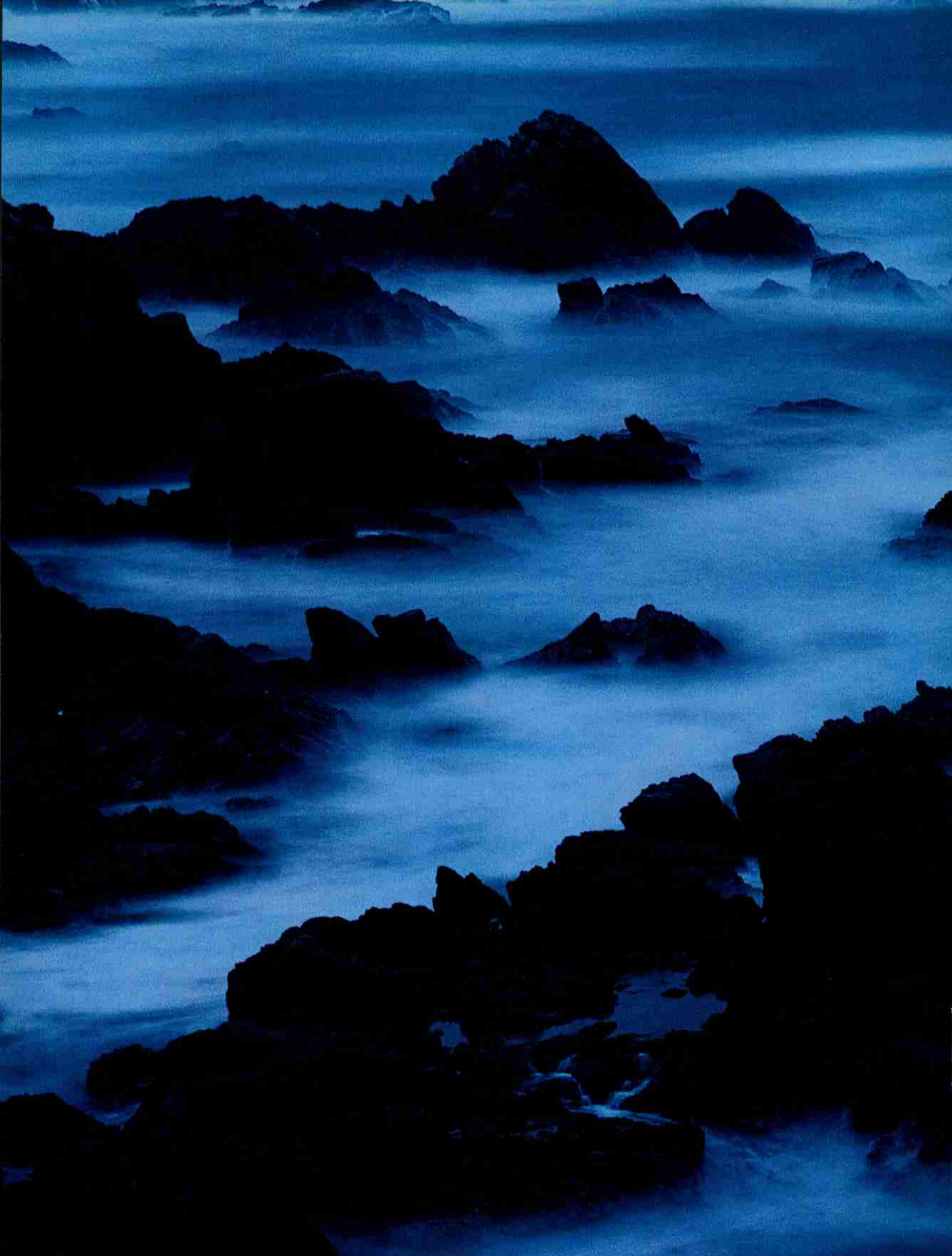
BY PICO IYER PHOTOGRAPHS BY FRANS LANTING

A WALL OF MOUNTAINS *plunges into the Pacific along 90 celebrated miles of California coast.*

A SPECIAL PLACE



State and federal preserves protect the wild solitude that lures artists, seekers, and plain folk to Big Sur.



TWILIGHT AND FOG *blur the edges of water and stone. Photographers and painters have long*



sought out the interplay of Big Sur's coves and cliffs, trying to "see this marriage of ocean and rock."

BELLS START TOLLING while the last stars still fleck the sky. As the heavens above Big Sur, California, shift to indigo, then milky white, then blue, the sea appears down below—more than a thousand feet below—framed by skinny eucalyptus trees and swaying, golden pampas grass six feet high. Along the coast to the south the hills that roll down to the ocean stretch away like sleeping lions. A few white-hooded monks walk along a winding road where orange-and-black monarch butterflies flit over wildflowers. In the early light there is nothing to be heard but singing birds and the scuffling of rabbits through the underbrush.

Toward dusk, three black-tailed deer gather in the shade outside the chapel, and as darkness falls, a fox appears on the terrace outside my cabin, asking for its dinner. There are almost no lights for as far as one can see, not even any houses—just the occasional taillights of cars winking around the coast in the distance and, all around, the profligate stars.

All monasteries, of course, are otherworldly, and the Benedictine Immaculate Heart Hermitage where I go for a few weeks every year in the hills of Big Sur is less remote than some. But the sense of untroddenness here, the mix of expansiveness and depth are even greater than what I've known in Ethiopia or Tibet. And in Big Sur such a sanctuary is less the exception than the rule, for the whole 90-mile stretch of rocky coastline, winding from Carmel in the north (where Clint Eastwood used to be mayor) to San Simeon in the south (where William Randolph Hearst built his 165-room castle), is like a collective monastery of sorts, tucked into the heart of the West—and devoted to solitude, wilderness, silence, and freedom from the hustle-bustle of the everyday.

Each year more than three million visitors navigate the treacherous turns of Highway 1 and cross its soaring arch-span bridges, its narrow passes, and the unique curiosities, just north of here, of Point Lobos, which artists have called "the greatest meeting of land and water in the world." Yet for a tiny cluster of rugged souls, fewer than 2,000 in all, scattered around some 250 square miles, this place out of time is something more, a constant companion whose moods we come to know like a member of the family's: the hills a vault of jade in March, carpeted with golden poppies and purple lupines and blue-blossomed wild lilacs before turning tawny and dry in the summer; the coastal fog curving around the waist of mountain slopes and flitting across the ocean so fast that every hour suggests a gray day and a radiant day at once; and the thick ancestral darkness of the redwood groves that gives way, suddenly, to open sunlit meadows where cattle graze above the sea.

Much of the power of Big Sur arises from the feeling that you are entering somewhere ancient, pre-human almost. Geologists suspect that the Santa Lucia Range emerged from two great blocks of rock that were riven by faults, including the San Andreas to the east. The land is not very old, but the 200-foot-tall redwoods that preside over the canyons were around, in many cases, before the language that we speak.



PICO IYER, a fan of Big Sur since his teens, is the author of six books, including *The Global Soul*. FRANS LANTING's work has been published in more than a dozen books, most recently *Penguin* and *Living Planet*. He lives near Big Sur.

The very absence of all signs of man suggests that
the sovereign elements here are rain and rock and sea.



SCRUB-LINED GORGES *become wind tunnels as sea air rises swiftly from the Pacific, slicing through a narrowing canyon. On exposed ridges the near-constant winds prune coast redwoods and California laurels into what naturalists fondly term "bonsai forests."*



SOME ARE OLDER THAN CHRISTIANITY; *some grow taller than the Statue of Liberty. The*



coast redwood, Sequoia sempervirens, *endures dry summers by sipping moisture from the shrouding fog.*



And everywhere the very absence of all signs of man suggests that the sovereign elements here are rain and rock and sea. Even the Spanish, who so diligently colonized the California coastline, could never quite penetrate Big Sur, though they bequeathed to the area, from their capital of Monterey, the name *el país grande del sur*—the big country of the south. And when one of the first explorers, Juan Rodríguez Cabrillo, sailed past in 1542, seeing hills climb rapidly up to 5,000 feet, he reported "mountains which seem to reach the heavens."

For millennia then, the only settlers in Big Sur were Indians, mostly of the Esselen and Salinan tribes, who supported themselves by making the most of the area's extraordinary variety of resources, eating greens in the open meadows in the spring, acorns from oak groves in the fall, and stored shellfish from the coastal waters after it turned cold. When the 19th century began—and the area was still thick with condors and



SUMMER WAVES *pulse gently through beds of kelp. Winter's punishing storms can shear off the floating canopy of these underwater forests, ripping up stalks anchored to the bottom nearly a hundred feet below.*

grizzly bears—almost no one had set eyes on Big Sur save for the handful of Indians who remained.

AS THE SPANISH BEGAN to set up their missions in Monterey and Carmel, the small groups of Indians quickly vanished—assimilated, perhaps, into the culture around them. And soon the Spanish gave way to the first American homesteaders from the East who accepted the challenge of the inaccessible terrain in the 1860s, hunting deer and cutting down trees for their houses. Many of these settlers are still remembered in the names—Partington and Post and Pfeiffer—that dot the area, and many of their descendants still own the land. By the turn of the 20th century the very loneliness and unworldliness of Big Sur had begun to attract the free at heart, especially as artists from nearby Carmel—poet Robinson Jeffers, photographers Ansel Adams and Edward Weston—started to sing of its moods. Yet until Highway 1 was extended all the way along the coast in 1937, not a single road ran the entire length.

That air of wild enclosedness has been vigilantly maintained by the residents who run the Big Sur Land Trust, and strict zoning laws and a limited water supply ensure that even now the population has hardly grown. But nature, too, has done her part to keep developers away: In 1977 a fire raged in the Santa Lucia Range for three weeks; just five years earlier another



fire had burned away the plant cover so that subsequent rainfalls triggered mudslides that nearly buried the area's single strip of grocery store, post office, and trailers. It seems almost symbolic that in 1894 the S.S. *Los Angeles* came to grief on the rocks near Point Sur—as if the elements were doing their best to repel the city to the south.

THE AREA THAT GREETS the visitor today, therefore, looks like an immemorial canvas fashioned by local gods. At points like Pfeiffer Beach, waves have created sea arches, blowholes, and offshore sea stacks, while, up above, the mist races across slopes of sagebrush, rags of cloud getting caught in coast live oak and ponderosa pine. Sea otters bob by the score just off the coast at sunset, and brown pelicans plunge into the choppy waves. Because of overlapping migratory paths, the variety of birds in evidence is astonishing. Up in the hermitage blue Steller's jays and hummingbirds dart around the chaparral while red-tailed hawks wheel through the heavens, and behind them in the hills wild boars forage among wild mustard, licorice ferns, and irises.

Big Sur offers several kinds of wildness all at once—and the constant interplay of hill and creek and tree and ocean, all meeting at odd angles, results in such oddities as a waterfall that shoots directly down into the sea. In a single day in summer, in the inland valleys, the temperature can plunge by 50 degrees, and as clouds cover the ocean, then suddenly lift, the weather itself becomes an hourly event.

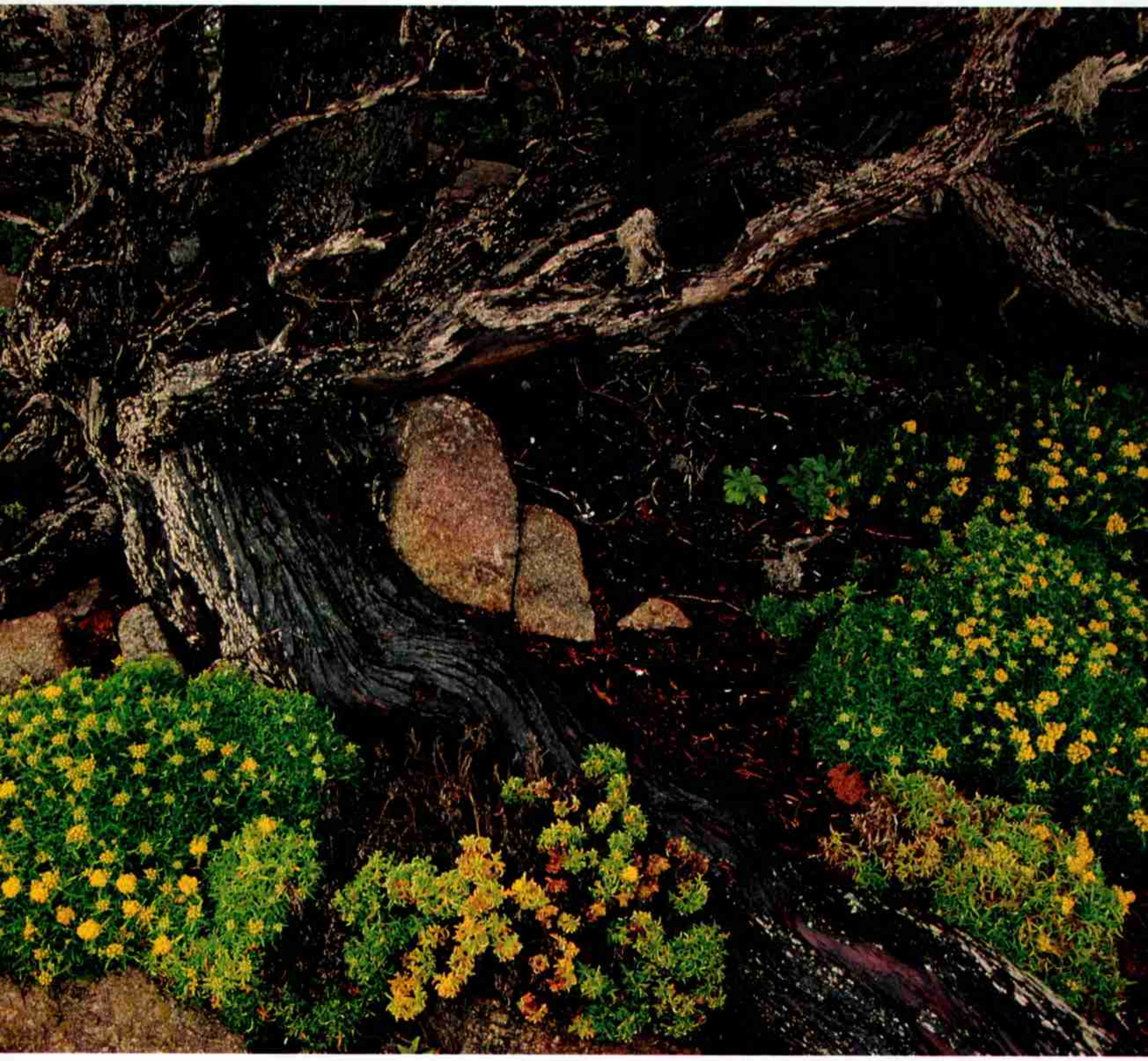
The sea, too, is different in Big Sur: Because the waves are not washing up on a beach but foaming around rocks, there is a perpetual roar and boom and thud audible a thousand feet above in the hills. (Jack Kerouac once wrote a 22-page poem simply annotating the sounds of the sea in Big Sur.) Around the motel-size town of Lucia the ocean has a pale, blue-green clarity—a sweetness and transparency—that I have never seen elsewhere on the Pacific coast. And, most of all, the ocean offers limitless horizons: There are seldom boats in the icy water, and I've never seen bathers or cruise ships. There are no oil derricks or islands in the distance. Nothing but the occasional gray whale and a vast, unwrinkled sheet of blue that seems to dream off toward Asia.

As a result, perhaps, the only people who try to settle here are a few "resourceful, self-sufficient souls," as Henry Miller put it, who choose to live simply and alone, like latter-day Thoreaus, staking their claims far from the profit curve and dwelling sometimes in convicts' shacks, sometimes in precarious cliffside houses. Many are painters and poets, even barefoot banjo players; a surprisingly large number of people still walk along the coastal highway or hitchhike it. And such few habitations as do exist try to do justice to their unspoilt backdrop. (In the $755-a-night ocean houses in the fancy Post Ranch Inn there are no televisions.) Even now the obdurate toughness of the area often drives would-be residents away, and many settlers live without power lines or telephones.

Big Sur, then, is a place for kerosene lanterns and foghorns and the crash of the sea through the mist; for rainy days around the fire at Nepenthe restaurant and star-filled nights at hot spring baths, listening to the waves whisper round the black rocks below. It is a place



Many settlers live without power lines or telephones.
Big Sur is a place for kerosene lanterns and foghorns.



"IT IS BITTER EARNESTNESS *that makes beauty," wrote poet Robinson Jeffers. Jeffers first came in 1914 to the Big Sur bluffs, where cypresses hunch low against cutting winds and shelter yellow-flowered lizardtail among their clinging roots. He stayed for the rest of his life.*



TENDING THEIR OWN BLAZE, *firefighters scorch a stretch of the Santa Lucia Range to halt a*

lightning-sparked fire. Big Sur naturalist John Smiley calls the wildfires "another type of weather."

Big Sur provides a humbling reminder
of forces much bigger than we will ever be.



LAST LIGHT *tints air and earth a dozen shades of violet and vermilion as pillars of wildfire smoke pierce fog unrolling from the Pacific. "Elemental forces have shaped this extraordinary place," says photographer Frans Lanting. "Seeing that has opened my eyes to a landscape I thought I knew."*



that has scant time for the ordinary: The settlement of Gorda, a town the size of a road stop, traditionally advertises a "city hall" (which looks like a café), a "cultural center" (an office), and two llamas. The main arts and crafts gallery on Highway 1 is situated inside a redwood water tank. Though a few affluent outsiders like Ted Turner and the late Linus Pauling have made part-time homes here, most of Big Sur has clung to its air of crooked "No Trespassing" signs and inhospitable dirt roads. The funky, rustic Deetjen's Big Sur Inn has few modern conveniences, and instead of telephones there are diaries beside each bed in which guests can pour out their hearts. "Nowhere on earth have I experienced the exquisiteness of being as in Big Sur," declares one. Or another: "The tranquility and staggering beauty of this place are enough to renew anyone and overcome anything that happened in 'that other world.'"

Most of all, Big Sur inspires thoughts of the heavens simply because it provides a humbling reminder of forces much bigger than we will ever be. It is no coincidence, I think, that not far from where I sit there is a place called Devils Canyon, and farther north another named Puerta del Diablo. For many sightseers crawling along the cliff-top road in pea soup fog, haunted by the sound of the waves several hundred feet below and the knowledge that the rocks are strewn with the wrecks of cars and long-ago ships, Big Sur has a terrifying aspect. And on one recent night as I walked along the monastery road, gazing up at the sharpened stars, a passerby pointed out that there was a mountain lion a few steps behind me.

On my previous trip up here, two months before, I had to drive past two roadblocks and along 11 miles of silent road cluttered with fallen trees and pieces of debris, the highway itself reduced to red earth in places by heavy rains and mudslides and the asphalt cracked, as if nature were reclaiming it.

I felt more than ever as if I were traveling away from every trace of the world I knew. I climbed the steep road that leads to the hermitage, making my way around boulders and past huge branches. At the top I found two monks waiting to greet me and asked them about the recent fires that had laid waste to much of the surrounding Ventana Wilderness.

"It came within three miles of us," said one. "At one point the road was blocked, and there was no way for us to get out. It was radiant."

"For three days and nights the sky was clouded," the other one said. "I remember going down to the last bench on the road and seeing the whole ocean blood-red. And there were plumes of smoke rising from the hills, and every now and then you'd hear a tree explode, and then there'd be an echo, around and around. It was incandescent."

"You really live on the edge," I said, thinking of how my own home had been destroyed by a forest fire six years before and thinking of how we were standing in what could be a setting for a theological parable.

"We do," said the older monk. "A lot of people don't realize that. They see only the beauty."

Then the night began to fall around us, and the vesper bells to toll, summoning us all to prayer once again. □



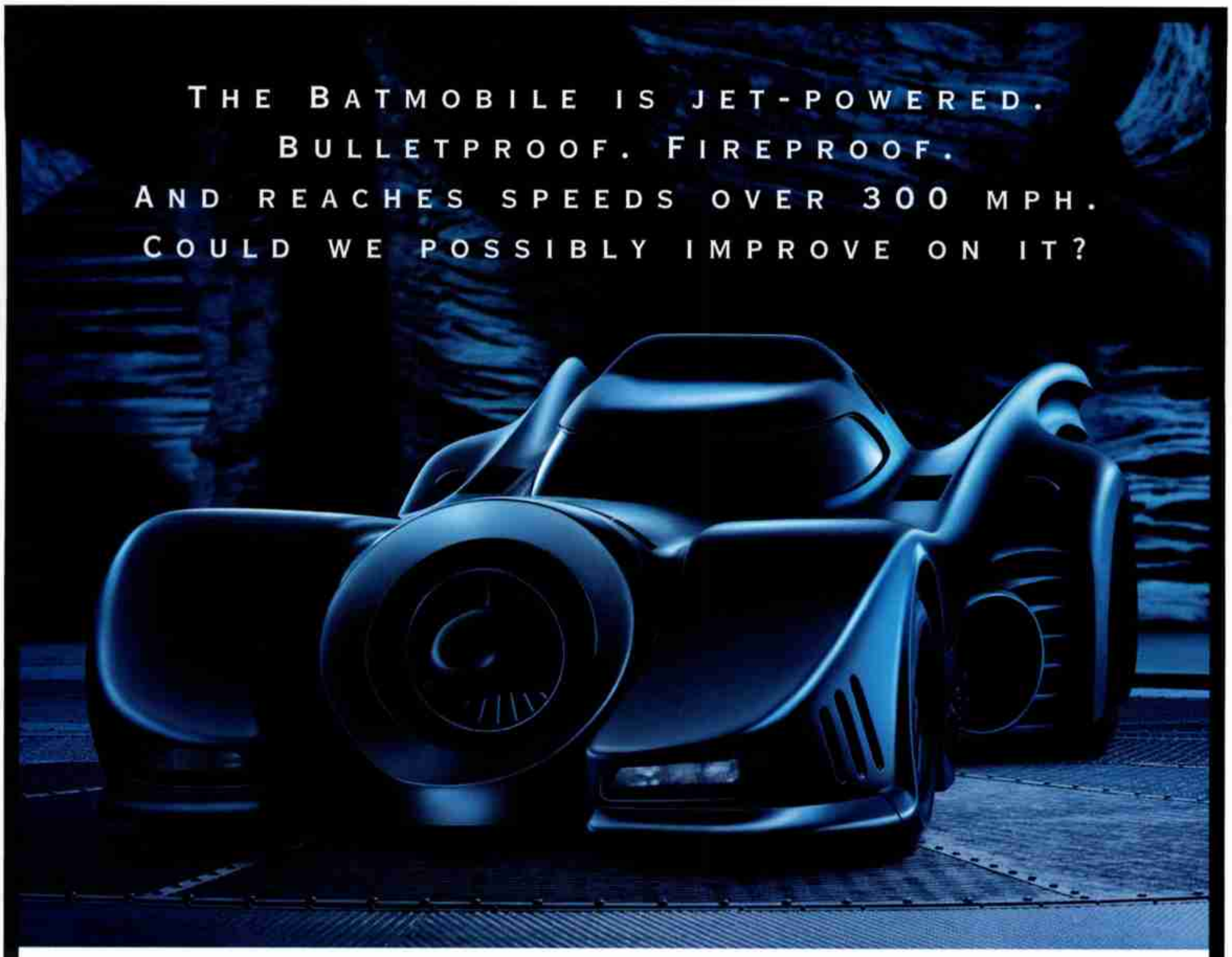
ASSOCIATED PRESS PHOTO

■ FROM THE GEOGRAPHIC ARCHIVES

A Long Story in Sydney

"I thought it must be the original sea monster," said fisherman Keith McRae, at left, who used a handline to haul in this 12-foot oarfish from Sydney Harbour in June 1954. Few photographs have ever been made of this species, *Regalecus glesne*, which can grow to 40 feet long and weigh as much as 650 pounds. Though they rarely venture from deep-sea waters, the creatures do occasionally wash up on shore and are thought to have inspired centuries-old sailors' tales of sea serpents.

This photograph has never before been published in the magazine.



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NATIONAL GEOGRAPHIC

Behind the Scenes



GERD LUDWIG (ABOVE); HARRY FERRIER (INSET); MEI LEN BARR

Meeting Again After Midway

Jack Iskin was in a doctor's waiting room last year, paging through magazines, when our April 1999 cover story, "Return to the Battle of Midway," caught his eye. He wasn't sure he wanted to look at the article—he'd lost a good friend in that battle—but he read it anyway. When he discovered that Harry Ferrier, the friend he thought had perished at Midway, was featured in the story, Jack let out a yell. Harry had accompanied author Tom Allen and undersea explorer Bob Ballard in the search for the lost wreck of the sunken carrier *Yorktown.*

Jack called the Geographic that afternoon to find out how to reach his long-lost friend. We put the two in touch the same day. Harry, it turns out, had also assumed that Jack was dead—killed at Guadalcanal while manning a radio direction finder in the bullet-riddled tower of the battleship *South Dakota.* The only survivor at his post, Jack eventually recovered from severe leg injuries.

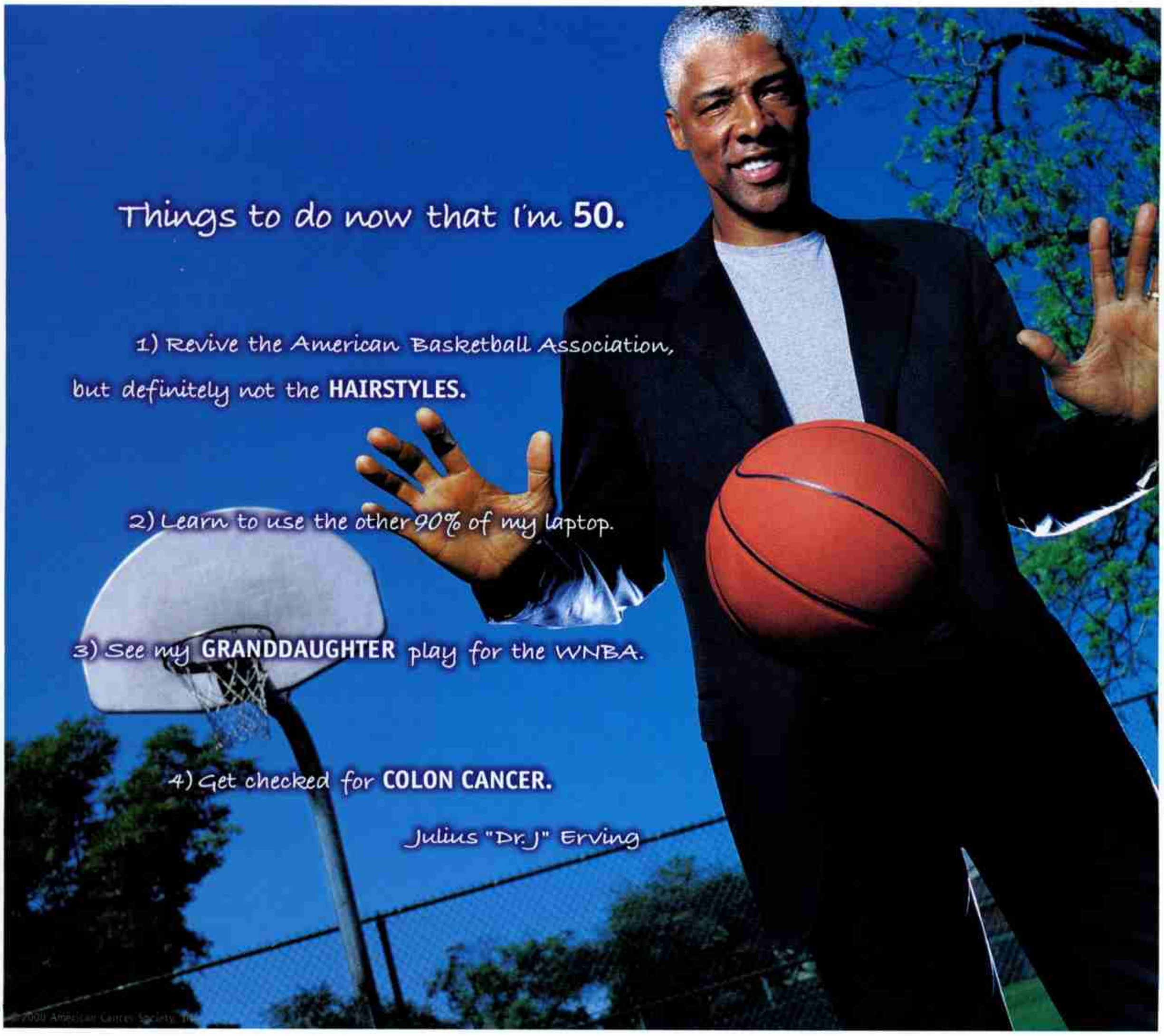
The pair met in person last October for the first time in 58 years. "I looked at Harry [above, at right], and I still saw the eyes of the 16-year-old he was in 1941," says Jack, now 76. "During our training in Jacksonville, Florida, we used to go out on the town for shore leave. Once we had pictures taken [inset, Jack at right], and I've kept them all these years. It always seemed to me that Harry was the kind of person you'd keep as a friend your whole life."

And now Jack will.



Heeeeeere's Brady: Working for Scales

Draped in snakes for our August 1999 issue, NG Television's Brady Barr so intrigued Jay Leno that he invited him to appear on the *Tonight Show* with more reptiles. Barr did, thrilling those in the audience as well as on the set: His 200-pound alligator snapping turtle got loose and drove actress Heather Locklear atop her chair.



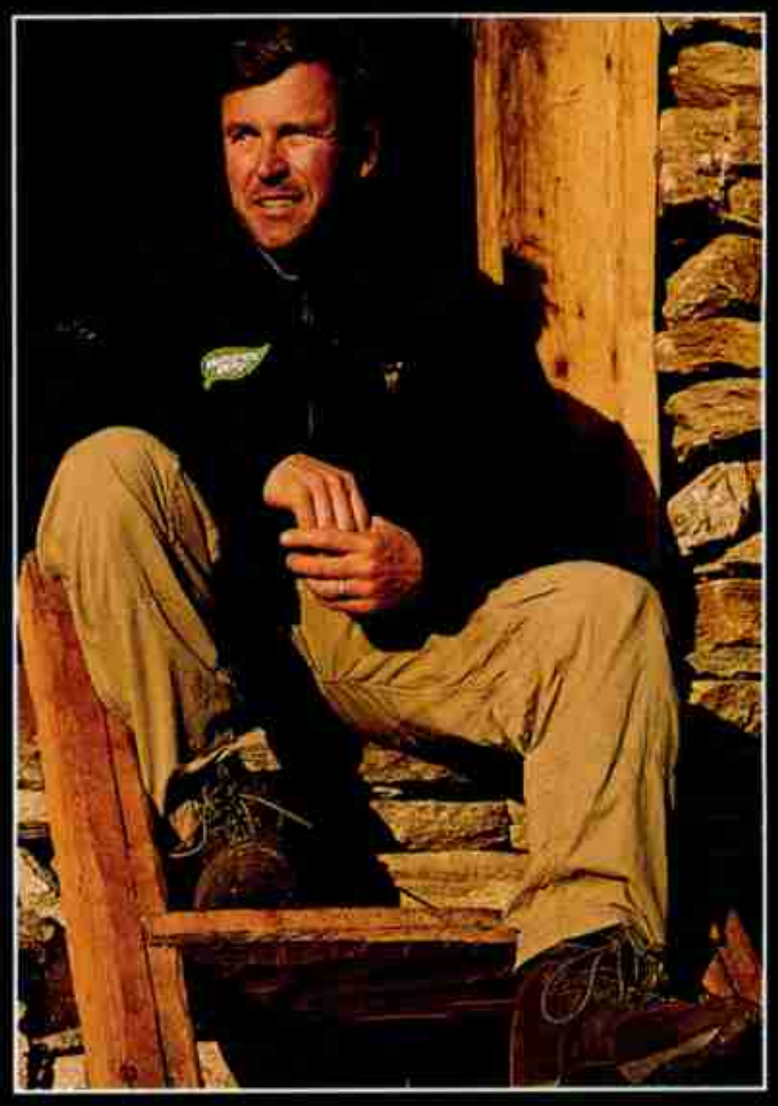
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Friends in High Places

Just before shooting from the heights of the Harbour Bridge in Sydney, Australia (above), photographer Annie Griffiths Belt encountered a star. Visiting New Zealand, she was introduced to actor Chris O'Donnell (right), who was on location for the new film *Vertical Limit*. In the movie Chris portrays a NATIONAL GEOGRAPHIC photographer involved in a mountain rescue. He accepted Annie's pointers on how to hold a camera, but, with a pregnant wife, Chris was more interested in her tips on international travel with small children—another area of her expertise.

Also appearing in *Vertical Limit* is Society Expeditions Council grantee Ed Viesturs (top right). He plays himself: a veteran mountain climber who offers guidance to Chris's character. Ed is no stranger to film. He also starred in *Everest, Pinnacle of the World,* the top-grossing IMAX movie of 1998.



CLOCKWISE FROM TOP LEFT: NICK CUBIN; VIEKKA GUSTAFSSON; KEN GEORGE, COLUMBIA PICTURES

■ FOR INFORMATION

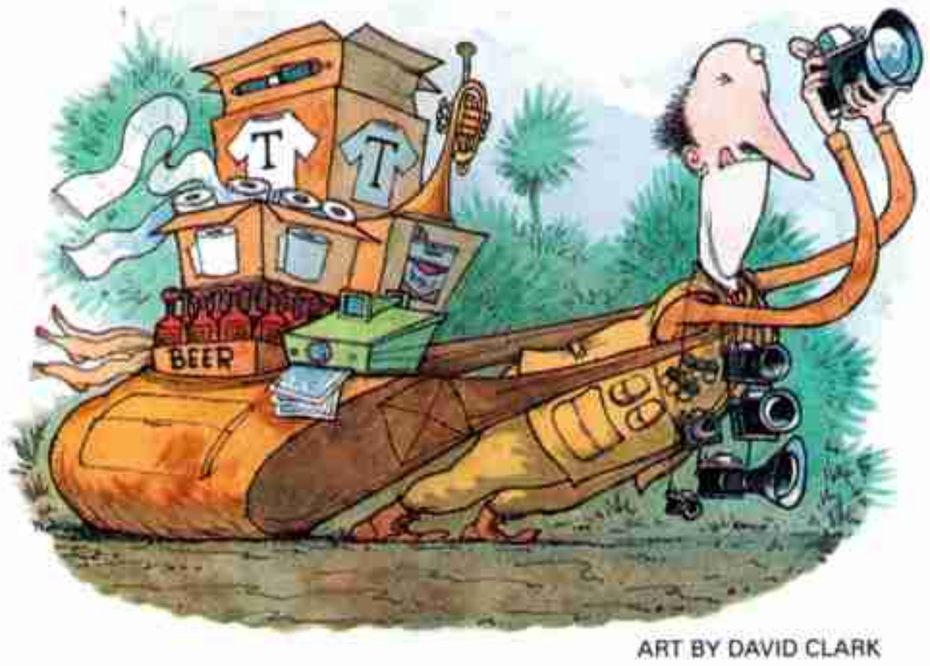
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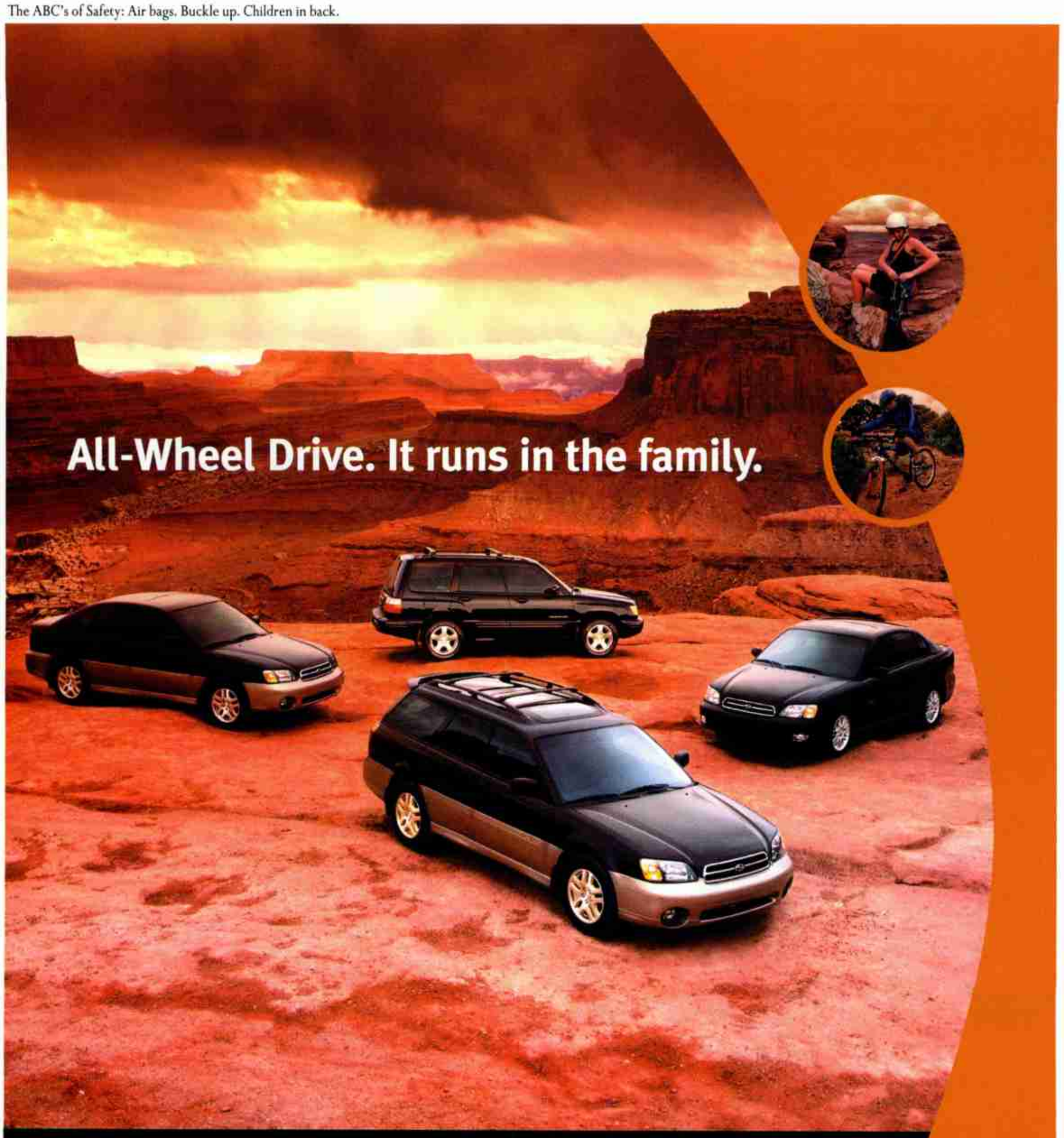
Gifts to Go

One of our writers always packs panty hose when visiting Russia. They're not for him—really. Distributing presents helps our staffers show appreciation for the help they receive in the field.

"I try to bring things they can't get where I'm going," says writer Tom O'Neill, who once took sugar packets to sweeten his way in Irian Jaya. Other charges to expense accounts have included such gifts as a trumpet to appease volcano gods, toilet paper, aspirin, flashlights, and a goat.

TEXT BY MAGGIE ZACKOWITZ

The ABC's of Safety: Air bags. Buckle up. Children in back.



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NATIONAL GEOGRAPHIC

CartoGraphic

Shuttle Radar Renders Earth in 3-D Splendor

After centuries of painstaking efforts to map the folds and creases of Earth's face, technology borne aloft on the space shuttle has brought us incredibly detailed information for nearly 80 percent of the planet's land area—all in a mere ten days.

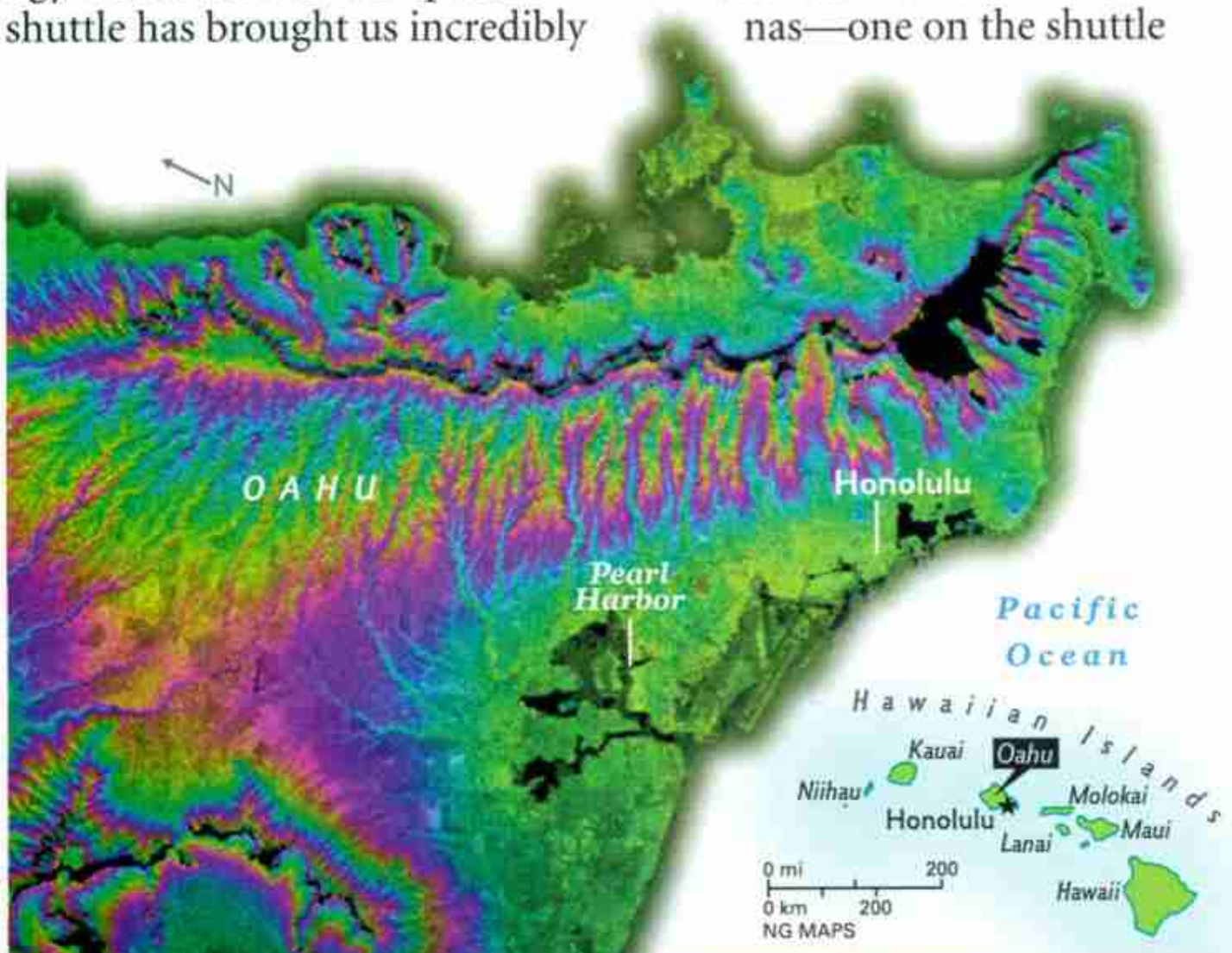
The measuring stick was cloud-penetrating radar waves that bounced off Earth's surface and returned to two antennas—one on the shuttle and the other at the end of a 197-foot mast extending from its cargo bay.

The tiny differences in the arrival times of the waves provided the means to build a three-dimensional portrait that, for most of the world, is far more accurate than existing maps.

Monochromatic in raw form, the data reveals its richness after processing. The rainbow-hued image of the Honolulu area of Hawaii's Oahu Island (left) is color keyed by height. The narrower the color bands, the steeper the slope.

The image below depicts the same elevation information but as a three-dimensional view. The realistic hues come from a Landsat 7 satellite image that has been digitally shrink-wrapped onto the rumpled surface.

TEXT BY ALLEN CARROLL
Chief Cartographer





IMAGES PRODUCED BY NASA/JET PROPULSION LABORATORY; LANDSAT DATA FROM EROS DATA CENTER, USGS

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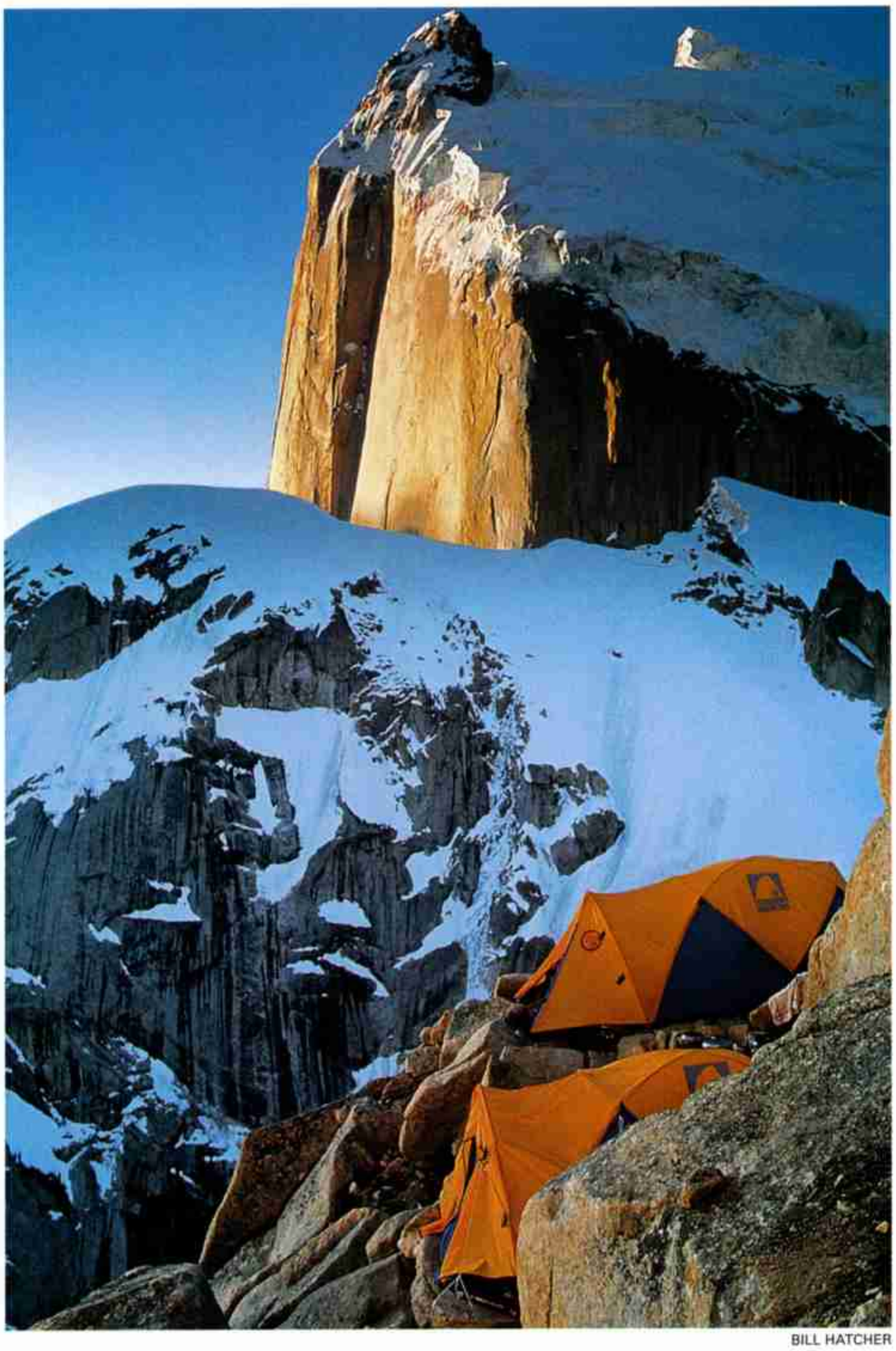
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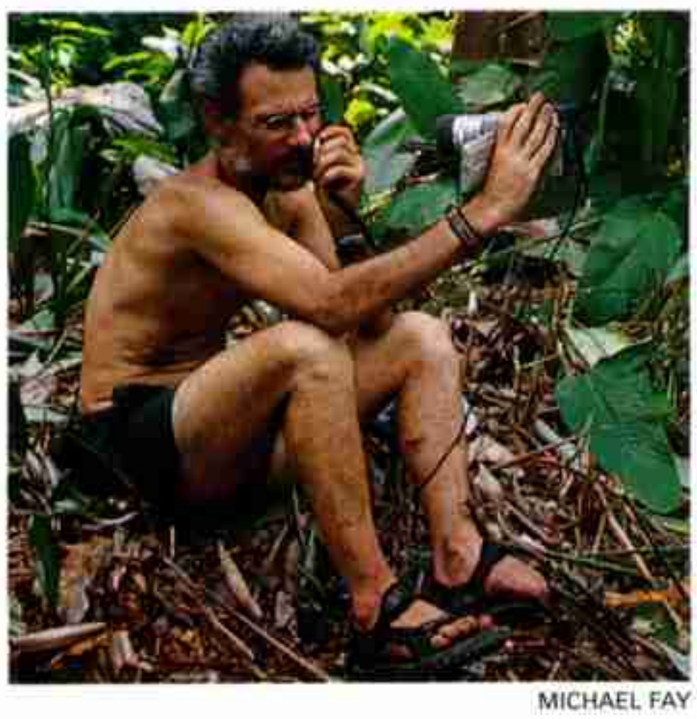
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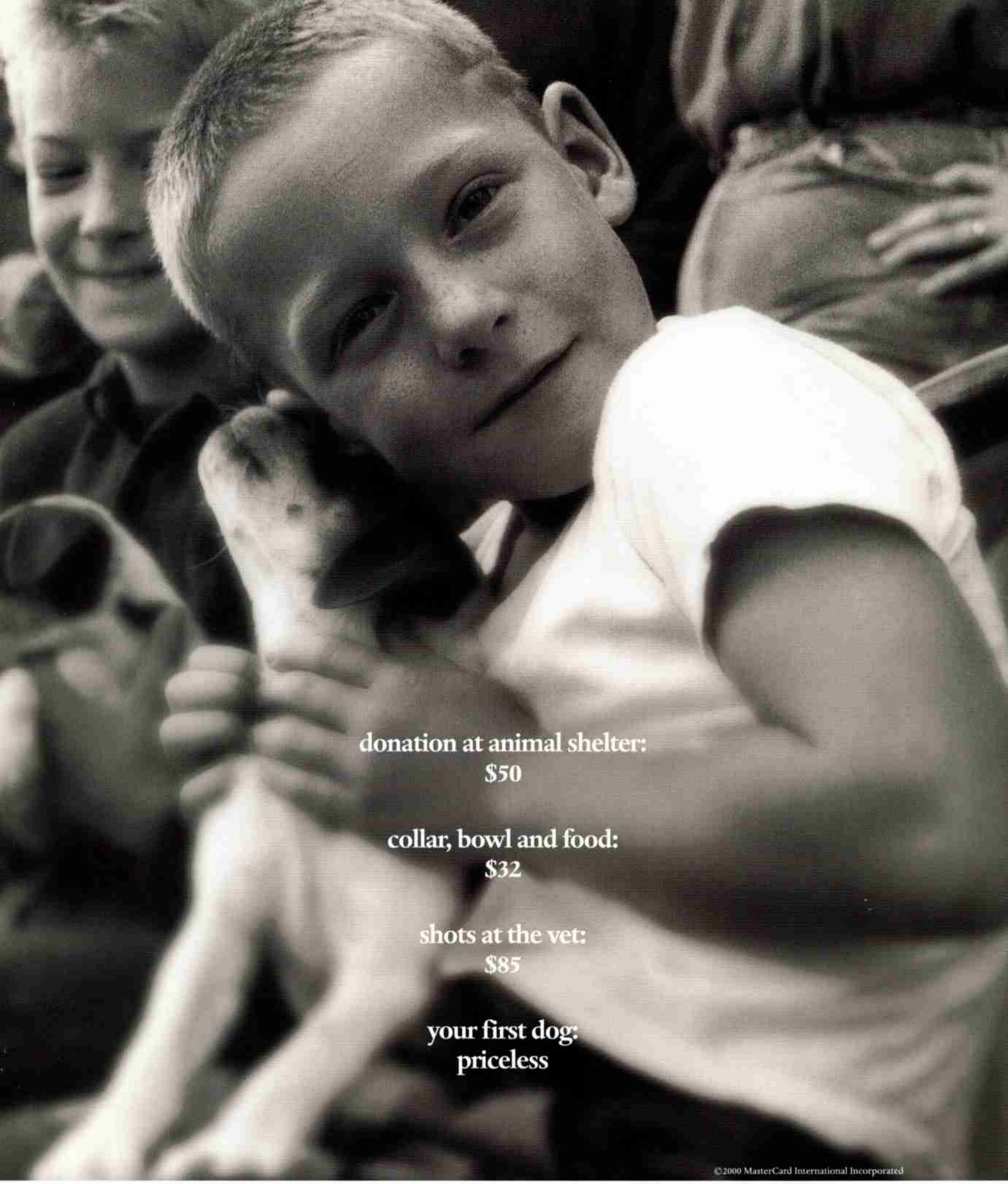
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